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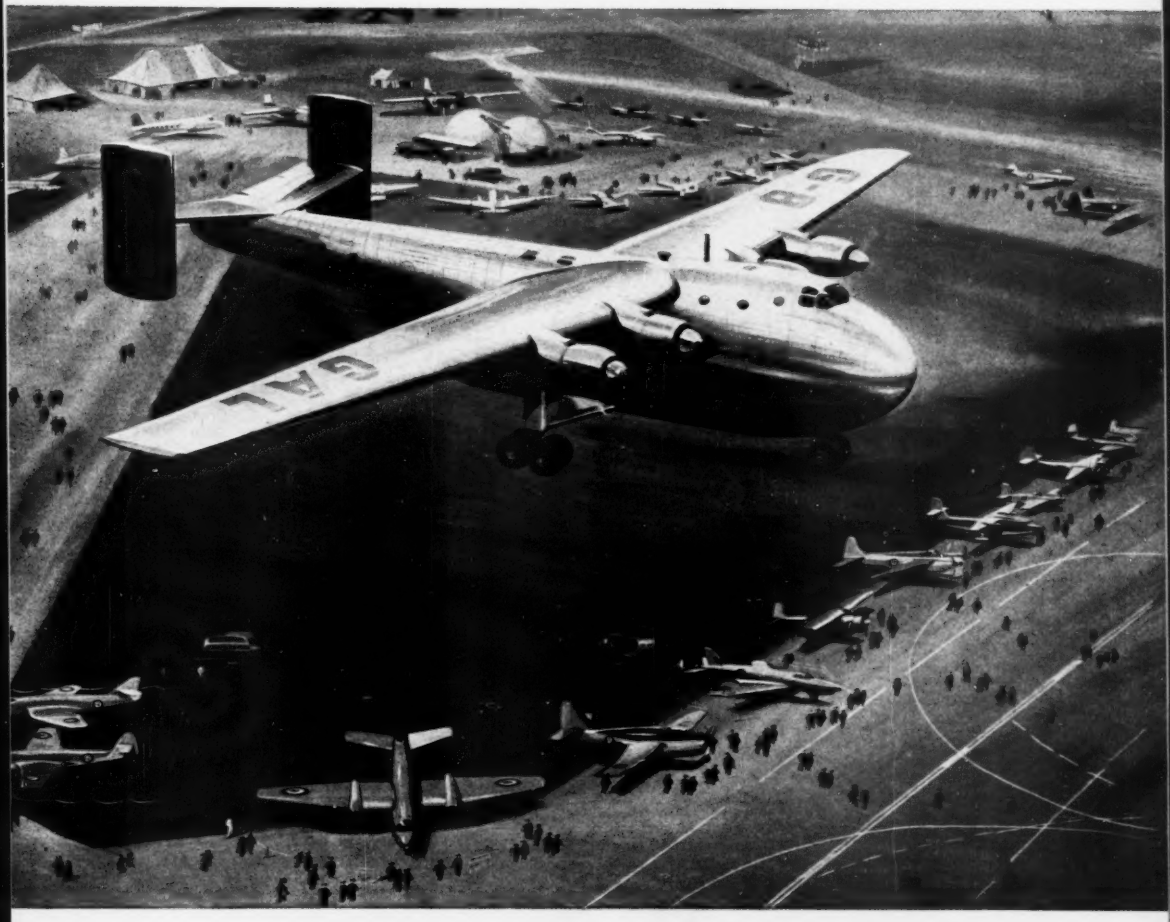

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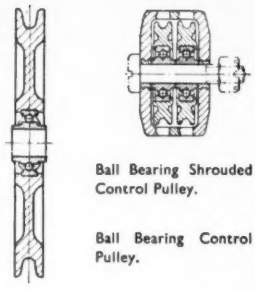

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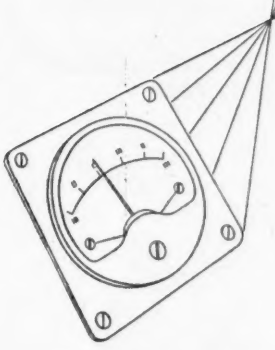

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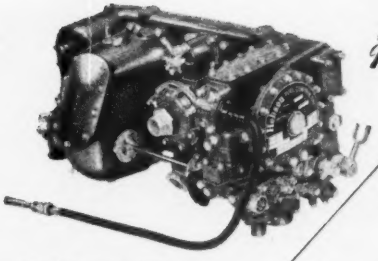

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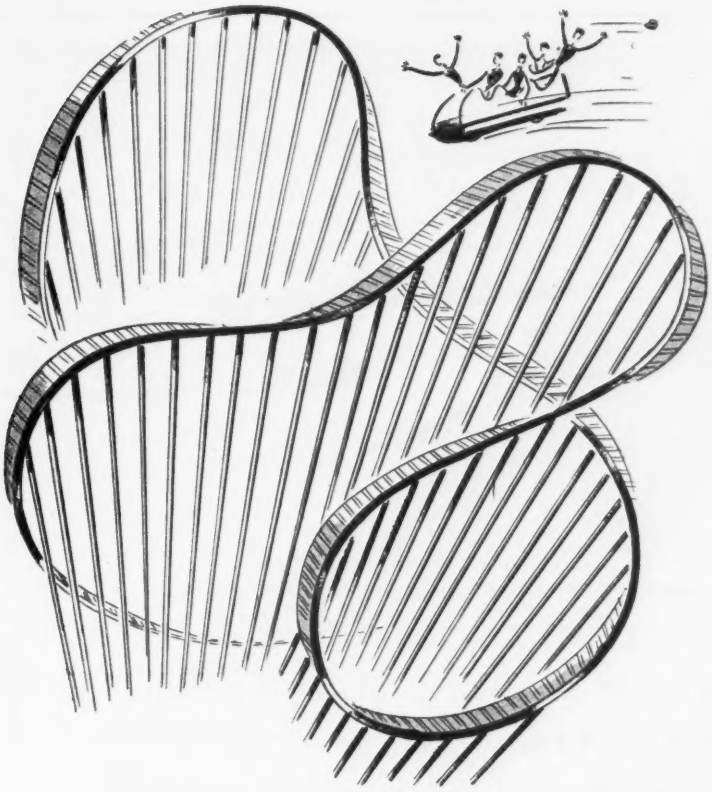

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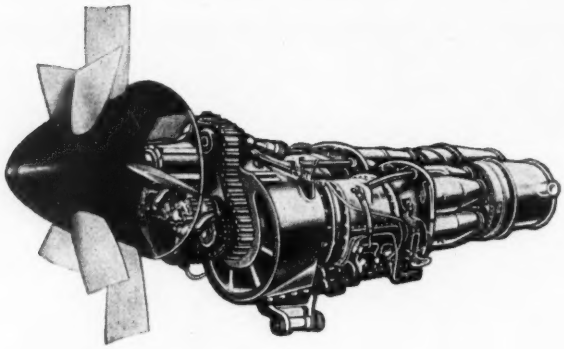

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First Aeronautical Weekly in the World

Founded 1909

No. 2232 Vol. LX. FRIDAY, 2 NOVEMBER 1951

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STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

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8-10, Corporation Street.
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Electronics "To Finish The Job"

THOSE items of equipment which fall under the heading of electronics probably represent the greatest single step between the old and the new in civil and military aircraft. It has been stated on more than one occasion that the modern jet fighter carries radar equipment costing more than the entire aircraft which was its counterpart in the Hitler War era. For example, the Canadian Defence Production Minister said recently that the CF-100's electronics cost more than a complete Spitfire. Another source has estimated that the Sabre's equipment, including its gun-sight, represents more than the cost of a complete Vampire of early mark.

A recent reference in the House of Commons to the number of individual electrical valves—measured in hundreds—in a modern bomber, each one of which is vital to the correct functioning of the piece of equipment it serves, was nothing short of terrifying in its implications. From the little that has been released about various forms of guided missile, also, it is known that here again at least a third of each project is the work of the electronics engineer.

Because of its preoccupation with domestic home and export needs, the electrical industry has found it difficult to divert sufficient of the manpower, particularly the brains, necessary to meet the requirements of the Services; thus in many important classes of equipment development has been slow and programmes are seriously behindhand. At the same time, such has been the technical progress in recent years, and development of operational techniques, that both fighters and bombers intended for all-weather night and day duties are virtually powerless without their radio communications equipment and radar aids for detection, sighting and navigation. Certain classes of vital electronic equipment must, in fact, be considered a close second to turbine and compressor blades as potential production-bottlenecks.

The appointment by the M.o.S. of Mr. N. C. Robertson as Director-General of Electronics, referred to on page 561, is welcome news, although it may be remarked that if this new post is a prerequisite for rapid development it was already overdue when it was created in July. For some time past, the majority of big concerns in the electrical and radio industries have been engaged on Ministry of Supply development contracts in conjunction with firms in the aircraft industry, and several have hinted at the difficulties encountered when trying to speed-up the work in hand. It is to be presumed the new D.-G. will be required to tackle these problems. We wish him success, knowing that he will not want for support from Air Marshal Sir John Boothman, Controller of Supplies (Air). We may add that the loss of Air Chief Marshal Sir Alec Coryton—Sir John Boothman's predecessor and, more recently, Chief Executive (Guided Missiles)—though the Bristol Aeroplane Company's gain, will be severely felt in the Ministry of Supply. A successor to Sir Alec has yet to be appointed.

Excursions and Alarms

LAST week-end an evening broadcast announcement by the B.B.C. gave details of a Gemini taxi aircraft which was believed to be many hours overdue, having taken off from Croydon early in the afternoon. Happily it proved to be a false alarm, for the machine was found to have landed at London Airport after only 35 minutes' flying.

This occurrence with a happy ending—except, perhaps, for the police and others who spent hours searching for and worrying about the aircraft and its occupants—brings to mind other occasions in the past when aircraft have been reported missing, often on cross-Channel flights, but have subsequently turned up unharmed at an airfield.

Airmen in this country fly the more comfortably for knowing that a very good emergency organization is in operation at all times. Though, not knowing the full circumstances, we do not impute blame in the case of the Gemini, the fact remains that it is imperative that cries of "wolf" occasioned by avoidable errors or downright carelessness about reporting arrivals or changes in destination should not be allowed to occur, and thus impair the efficiency of the emergency organization, discourage its members or cause unnecessary expense or inconvenience.

DEMONSTRATIVE

Display Flying : Some Factors which the High-speed Pilot Must Keep in Mind

By JOHN DERRY

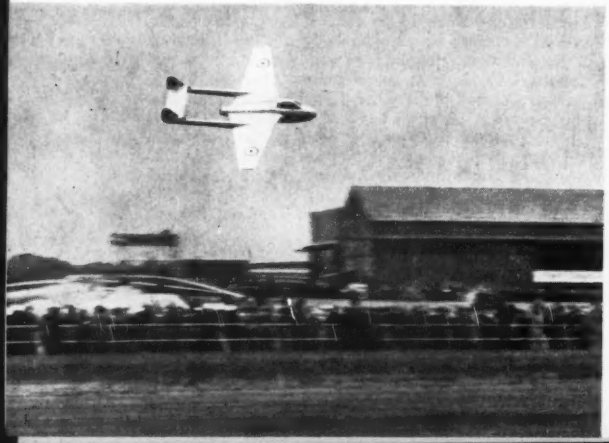
THANKS to the brilliant flying of the pilots at the S.B.A.C. Display last September, public interest in demonstration flying has undoubtedly reached a new high level, and we have sensed a keen curiosity as to "how it is done." Test and demonstration pilots are almost notoriously modest, but we have persuaded John Derry, D.F.C., de Havilland experimental test pilot, to reveal here at least a few of the guiding principles of the art.

WHEN one is asked to make a demonstration flight the request may imply one of a long list of possibilities, depending upon who makes the request. To pick out a few, it may imply a highly spectacular and dangerous beat-up, an exhibition of classic aerobatics, the making of as much noise as possible, or, of course, a genuine demonstration of the capabilities of the aircraft. Ironically, the last-mentioned, although most often the excuse for requesting a show, is seldom what is really required; and is hardly ever really possible, except for aircraft designed for short take-offs and landings and slow flying, e.g., helicopters. Here, however, it is my intention to discuss, mainly, demonstration flights on fighter types of aircraft.

It is quite impossible to demonstrate stability or control-feel to someone on the ground and, moreover, an aircraft that is very bad from this point of view can be made to look (by a strong pilot with good reflexes) like the answer to the aerodynamiscist's dream. Equally, a demonstration of climb by a jet aircraft at its best climbing speed will appear very flat; and the climbs actually made at demonstrations, although often spectacular, are well below the best rate of climb. In speed, too, the same applies. Even people accustomed to watching high-speed runs can be completely misled as to the fastest aircraft by such tricks as banking during the run or appearing from a blind spot.

There are many such examples of the inadequacy of a demonstration as seen by watchers on the ground. For the demonstration pilot, then, the natural decision is to provide some sort of compromise between the genuine attempt at an honest demonstration and the purely spectacular show.

A typical Derry demonstration : the occasion, Farnborough, 1948; the aircraft, one of the first de Havilland Vampire 5 fighter/bombers. With their small radii of turn and general handiness, the D.H. jet fighters are ideal media for the author's technique.



Depending on the reason for the show, the compromise may be biased more in one direction than the other. Thus, if the show is for a non-technical audience, it can legitimately be made of a more startling nature than when critical eyes are watching, say, the acceleration to top speed, or the touch-down attitude. It would, of course, be wrong to suppose that the technical spectator does not enjoy a good display of aerobatics and general evolutions. Moreover, during a technical demonstration in which many other aircraft are performing there is, perhaps, strong justification for drawing attention to the aircraft by the performance of an unusual or exciting manœuvre which may not serve any other purpose.

Healthy and responsible competition between pilots is thoroughly desirable and results in more variation—always an important aspect of demonstration flying. But it is, of course, essential that such competition should not be allowed to go too far ! This requires particularly careful watching when identical, or similar, aircraft are performing.

Aeroplanes can perform only a fairly limited number of completely separate manœuvres and, therefore, with one or two notable exceptions, any original manœuvre must be a variation on or combination of one or more of these classic aerobatics. Bearing in mind our earlier thoughts on a compromise between demonstration and spectacle, the pilot's first consideration must be to make his show as original as possible At least he must make it *look* original. Many hours of careful work have been spent in perfecting a difficult sequence which, while completely new to the pilot, appears dull and ordinary to those watching.

The question of how best to practise for one or a series of aerobatics is not easy to answer. But one point is quite clear. A very thorough work-out must take place at a good height (depending on the type) with a close watch kept on the average height-loss, if any, over a score of attempts. Except in manœuvres which involve temporary loss of control, e.g., a spin, I always feel that no height-loss should be permitted.

While a margin of safety must always be kept in hand, the pilot must never use up any of this margin; and, if all manœuvres are worked out as though without margins, a safer show results. Fortunately, during aerobatics one usually feels nearer the ground than is, in fact, the case. Although one hesitates to encourage lower aerobatics there have been cases where the confidence bred of height or climb has resulted in sloppy manœuvres, sometimes with fatal results. Low-level aerobatics *must* be accurate, and a pilot who has practised them over thin cloud and at a safe height first will be safer (and, most important, will *look* safer) than the non-practised and over-confident pilot at 1,000ft.

While there can be no doubt of the value of practising each individual manœuvre (and, even when familiar with it, keeping in practice) the value of an actual run through one's complete show is less obvious. Personally, I always find when I try this that it is almost impossible to get into the swing of it, and often feel dissatisfied, rather than encouraged, by such rehearsals. Probably the fact of doing it over a different location, coupled with the absence of spectators and with no strict timing, gives a dull atmosphere not in keeping with the actual show. For this reason the arrangement of the S.B.A.C. Display, whereby there is a full-scale programme

on the day before the "brass" appears, is invaluable to those pilots whose views I share.

On such an occasion I often find it necessary to change my original plan slightly. Although a pre-conceived plan is important, one should never reach the stage of being committed to a rigid sequence. Changes in one's plan of campaign are well worth while, of course, if another pilot is found, when the show begins, to be using similar tactics. Often, very small changes in the way in which a manœuvre is performed are sufficient to provide a completely different appearance. On the other hand, due to an unfamiliar setting or to some unexpected take-off arrangements, one may find oneself in the middle of a tight turn which is not going to finish in the right position, and a hasty direction-change is necessary. Sometimes a roll or a loop may serve to re-position the aircraft without producing a hiatus. It must always be remembered that, in a show lasting five minutes from take-off to landing, not one second can be afforded which is not actually part of the show. Even a turn should be made so as to form part of the display and not as an interval between short, sharp rushes at the crowd. Naturally, after a maximum-speed run in a fast aircraft a lot of ground will be covered in the ensuing circuit, but immediate use of air brakes and a high-g turn can serve to bring the aircraft quickly back to the arena at reduced speed for the more intimate part of the show.

Occasionally it is effective to sweep up in a steep climb into clear blue sky from a high-speed fly-past, but the value of this must be weighed against the difficulty of losing height again quickly, while still remaining over the airfield. Sometimes one finds the crowd disappearing under the nose during such a dive and the low part of the pull-out is then made well beyond them. There is very little that can be done in such circumstances once one is committed to a steep dive. Many of these points are perhaps unimportant when time is not a primary consideration; but they are vital when one is allowed only five or six minutes.

On a high-speed run, particularly in aircraft with manual controls, it is very difficult, or impossible, to make any last-minute changes in flight-path—and by "last-minute" I mean a change within one-and-a-half or two miles of the crowd. Consequently, such runs have to be very carefully placed from the start and this applies, of course, to dropping-off the odd hundred feet before the fly-past. I imagine other pilots may have shared my experience of discovering, too late, that it is not possible to lose the necessary height in time and of experiencing the subsequent anti-climax of a fly-over at a few hundred feet instead of 50 ft or so.

During aerobatics in a modern jet fighter the means of making a manœuvre accurate are very different from those in the old days of sitting "on" or behind the wing(s). Particularly in swept aircraft, it is a neck-breaking business to see one's wing-tips while subjected to 3 or 4 g or even more; and, even if it is possible and easy, the relative position of the wings to the pilot provide only a rough check on the attitude of the aircraft in steep climbs and loops. Therefore it is most important to start a loop dead straight and to hold the controls steady. On aircraft without airscrews there is usually no change in directional trim with speed, so there is little chance of going "crooked" on the way up and small errors can be hastily corrected when the horizon reappears.

Equally, when flying inverted it is more difficult to judge one's height, and on many fighters this is aggravated by the blind spot between the windscreen and canopy being directly in one's line of vision forward. It is then necessary to make all height adjustments by looking up (or should it be down?), through the top of the canopy, at the ground directly below rather than ahead. This makes the positioning for a very low inverted run doubly important, because obstacles ahead may not be in view.

I have already mentioned the difficulties of making each show distinct from its predecessor and of avoiding dreary repetition. From the organizers' viewpoint a possible line to take in this direction is to allow each pilot in a large show to demonstrate only one feature of the performance or handling characteristics of his aircraft. Thus there would be, for example, one aircraft making only a high-speed run, one showing a climb, one its agility in fighting manœuvres, and

One of the most dramatic pieces of demonstration flying ever witnessed in this country was Geoffrey Tyson's inverted run at Farnborough—again in 1948*—in the Saunders-Roe S.R./A.1 jet-propelled flying-boat.*

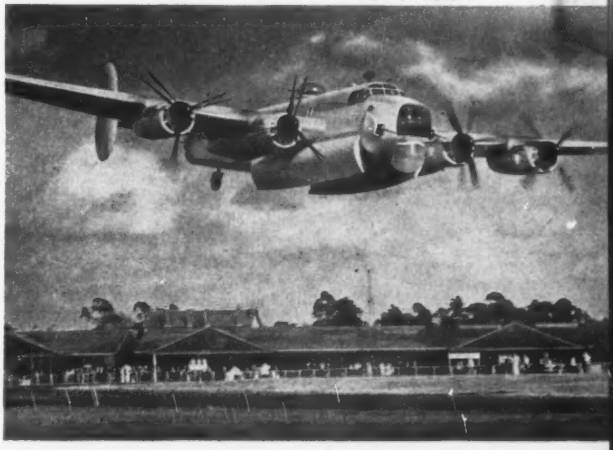
so on. There would inevitably be *some* repetition, but the risk of the complete show or one individual act dragging would be obviated. It is wise to leave people wishing that they could see more rather than that they had seen less.

In the future, as in the past few years, there will be changes in the types of demonstration at big displays; but there will always be a need for good classic aerobatics, even if the aircraft that performs them has to be out of date. More important, pilots will require to use a great deal of thought in order to produce an original show, and this in itself will be valuable. Speaking for myself, I have learnt a great deal simply from practising a manœuvre or combination of manœuvres. Aerobatics and general demonstration flying are by no means a dead loss to the pilot performing them. Furthermore, one pilot may learn from watching another.

But the main purpose of a demonstration is to convince people who are not pilots. Constructive criticism, from such spectators, therefore, is most valuable. More frank comments on the lines of play criticisms would, I am sure, encourage more originality and more interest—both vital to a good display.

Avro's "Johnny" Baker never fails to make an impression with the massive Avro Shackleton, seen here, with two Griffons cut and bomb bay yawning, at Farnborough in 1949.

"Flight" photograph



FROM ALL QUARTERS

Re-entry of the Gladiator

IT it generally agreed in responsible quarters that Mr. Winston Churchill's assumption of the title of Minister of Defence as well as that of Prime Minister—thus re-creating his extraordinarily effective dual rôle of 1940-45—will be of inestimable value to the country's defence effort.

Quite apart from the character of the man himself, his career has placed him in a unique position to understand the needs of the fighting Services while still being able to integrate them, in statesmanlike fashion, with all the other conflicting demands of a nation's progress. We are, perhaps, apt to forget that, apart from his distinguished service as an Army officer (and, later, war correspondent) at the turn of the century, he has occupied several ministerial posts which have brought him into daily contact with Service affairs: he has, for example, been First Lord of the Admiralty (twice, 1911-1915 and 1939-40), Minister of Munitions (1917) and Secretary of State for Air (1918-21). As Honorary Air Commodore of No. 615 (County of Surrey) Squadron, R.Aux.A.F., also, Mr. Churchill has shown a far closer interest in practical Service flying that such a title theoretically demands. Pilots who flew him across the Atlantic, and on other long trips during the war, well remember his curiosity as to "how and why" in matters of aircraft handling and navigation.

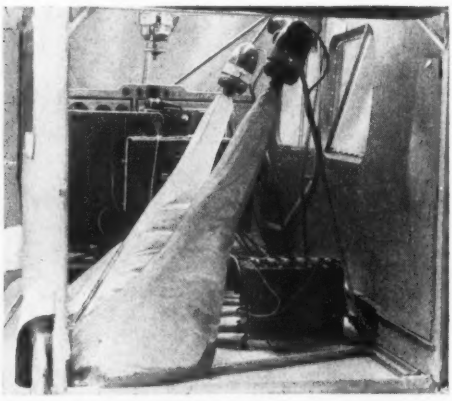
Remembering the incisive way in which he dealt with any and every form of red tape and obstructionism during the Second World War, senior officers of all three Services today foresee a quick and drastic change in methods of attacking the country's defence problems.

As A. Cdre L. G. S. Payne says in *The Daily Telegraph*, Mr. Churchill may also be expected to ensure that the large sums that have been allocated to the Service departments and to the rearmament programme are devoted to essential needs. It is widely felt in the R.A.F. that too much money is being spent on administrative, welfare, educational and other services which are not indispensable to the operation and maintenance of aircraft.

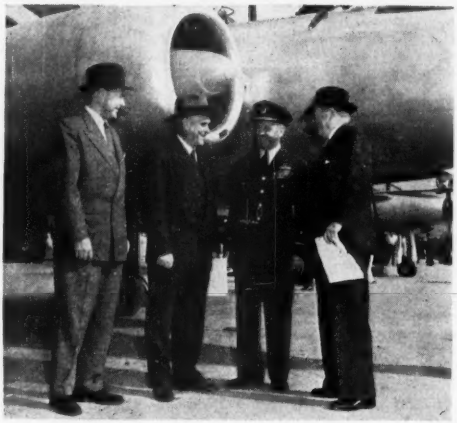
"Meanwhile," continues the same writer, "new types of combat and transport aircraft are not reaching the first-line squadrons in adequate numbers. Nor are they likely to, in the foreseeable future, unless drastic steps are taken to increase the output of planes and engines, especially jet engines.

"The practice of using security regulations to prevent any understanding or criticism of our defence deficiencies has been constantly mentioned by Conservative members of Parliament. Mr. Churchill will probably decide to take the public more into his confidence."

It is also thought that the whole future of British commercial and private flying may come under review. Conservative statements during the election campaign have suggested that the functions of the Ministry of Civil Aviation may ultimately be delegated to other Ministries.



TALKING DOWN: Two air-to-ground loudspeakers and the necessary amplifying equipment installed in the Auster ambulance/freighter which took part in the recent Army manœuvres. The ordinary floor of the hold is removable when six bolts have been withdrawn, and a "special-purpose" floor such as this can be substituted. Apparently the fabric horns are surprisingly effective.



FIRST OF MANY: This cheerful group was photographed at the ceremony which, as reported last week, marked the delivery of the first Orenda-powered Avro Canada CF-100 to the R.C.A.F. Left to right, Crawford Gordon, Jr., president and general manager, Avro Canada; the Rt. Hon. C. D. Howe, Minister of Defence Production; Air Marshal W. A. Curtis, Chief of Air Staff, R.C.A.F.; and Sir Roy Dobson, chairman of board, Avro Canada. A picture of the aircraft appears on page 558.

Sir Alec Coryton Joins Bristols

THE directors of the Bristol Aeroplane Co., Ltd., announce that, with the consent of the Minister of Supply, they have invited Air Chief Marshal Sir Alec Coryton, K.C.B., K.B.E., M.V.O., D.F.C., to join their board as managing director of the engine division. Sir Alec has accepted the invitation and will take up his new post as soon as the necessary arrangements following on his resignation of his official appointments have been made.

The Air Chief Marshal, it will be recalled, was appointed to the newly created M.o.S. post of Chief Executive, Guided Weapons, in August, 1950. His successor in this position had not been named at the time of our going to press.

Sir Alec Coryton has had a full and distinguished career since he transferred from the Rifle Brigade to the R.F.C. in 1917. In 1919 he was a flying instructor, and among his pupils was our present King. After his active flying career he occupied a number of important Staff and Command posts, including that of Deputy Director of Operations (Overseas) (1938); A.O.C. No. 5 Group (1942-3); Assistant Chief of Air Staff (Operations) (1943-4); and A.O.C. 3rd Tactical Air Force (1944-5).

In 1945 he was posted to the Ministry of Aircraft Production as Controller of Research and Development, and in 1947 became Controller of Supplies (Air), M.o.S., and Additional Member of the Air Council. Three years later came the Guided Weapons appointment referred to above.

Nene Production in Canada

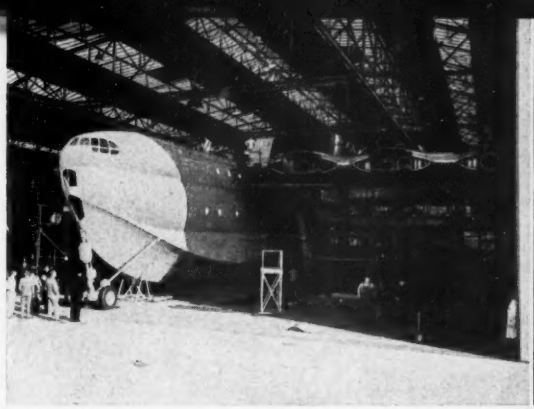
AN Ottawa report states that negotiations are under way for the Rolls-Royce Nene turbojet to be produced in Canada. Canadian-built Nenes would power the Lockheed T-33 two-seat trainers which are to be built by Canadair for the R.C.A.F.

As we reported last August, the original T-33 order was for 500 aircraft, and at that time the supply of power units was stated to be constituting a problem.

U.S. Commercial-aircraft Output

ACCORDING to figures published by the Civil Aeronautics Administration, the number of orders on hand for American aircraft carrying five passengers or more rose to 648 during July; this compares with 576 such orders in hand during the previous month and 160 in July last year.

Employment in airframe and engine factories, says the C.A.A., rose from 364,631 in June to 381,777 in July. In spite of increasing military demands on the industry, deliveries of commercial aircraft rose to 79 during the first seven months of this year as compared with 56 for the corresponding period in 1950.



THE FIRST PRINCESS was being transferred from the great Saunders-Roe hangar at Cowes to the concrete apron on Tuesday last. She is seen when, a few days earlier, preparations for the big move were in hand. Once transferred to the open air the Proteus power units will be installed, the outer wings added, and the vertical tail surfaces completed. Seen in the smallest view is one of the lateral stabilizing floats, retracted at the wing tip. The maiden flight should take place during the first half of next year.

Result of an Appeal

IT is announced by the R.A.F. Benevolent Fund that £26,022 has so far been received following Mr. Winston Churchill's broadcast appeal on Battle of Britain Sunday (September 16th). Donations are still being received.

Mr. Churchill has issued the following statement: "I should like to thank the public for their magnificent response to this appeal. In particular, I should like to express my gratitude to the 2,400 anonymous donors—to whom, of course, it has not been possible to write. The success of this appeal proves how firmly the men and women of the Royal Air Force are enshrined in the affections of their fellow countrymen."

The anonymous offerings referred to by Mr. Churchill totalled £960. Apart from the cash donations, some gifts were received for sale on behalf of the Fund. These included a collection of foreign stamps, and books and wine. More than £70 was received in postage stamps.

Confirmation Awaited

ACCORDING to a news agency report from Melbourne, Australian and New Zealand airline operators "are expected to place several million pounds sterling worth of orders with British and American aircraft factories within a few months." The source of the information is not quoted, but it is added that "the bulk of the orders would go to Britain for jet and turbojet planes" (presumably "turbojet and turboprop") and that "the new aircraft would be used for services to Britain, North America and New Zealand."

Russian Pilots in Korea?

GENERAL HOYT VANDENBERG, U.S.A.F. Chief of Staff, alleges that Mig fighters in Korea are being flown by Russian pilots. "When our Sabres tangle with Migs we can hear their pilots on the radio, and they all speak Russian," he is reported as saying. He went on to observe that these particular Migs operated well behind the Communist lines, so that there was little danger of dead Russians being found in shot-down aircraft by U.N. troops.

A Tokio report last week, incidentally, claimed that in the "biggest yet" Korean air battle, involving some 270 aircraft, between 14 and 17 Migs were shot down. A Superfortress and one of the escorting Thunderjets were lost.

A Los Angeles Symposium

"FLIGHT Experience with the Vickers Viscount Turbo-propeller Airliner" was the title of a lecture by Mr. G. R. Edwards, designer of the aircraft, one of six papers given at the S.A.E. National Aeronatuic Meeting held recently at Los Angeles. The other five were :—

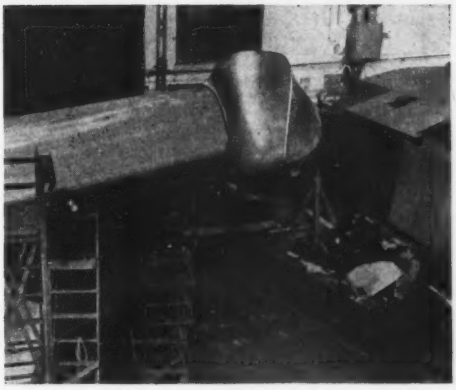
"Aircraft Maintenance in Korea," by Col. T. J. Noon, Aircraft, Fleet Marine Force, Pacific.

"Report of Explosion Suppression Development," by Jack Isreeli, Simmonds Aerocessories, Inc.

"Military Operation of Helicopters," by Keith Barr McCutcheon, Lt. Col., U.S. Marine Corps.

"High-Speed Pressure Refueling of Aircraft," by Ralph H. Lebow, staff engineer, Aircraft Fuels Systems, the Parker Appliance Co.

"Some Developments for Greater Crash Safety In Aircraft," by Robert Schroers, chief of the Structures Branch, Aircraft Division, Civil Aeronautics Administration.



It is our intention to give digests of some of these widely contrasted papers in forthcoming issues.

Vintage Aeroplane Club

IT may be remembered that in *Flight* a month ago Mr. R. E. Gillman suggested the formation of a Vintage Aeroplane Club. On Monday news reached us, from another quarter, that a club under this title has now been formed, and that an informal meeting is to be held at White Waltham Airfield tomorrow, Saturday, November 3rd, at 2.30 p.m. An arrival competition for "elderly aircraft" will be held from 1.45 to 2.15 p.m. Membership of the club is open to all owners and operators of aircraft built before 1938. The hon. secretary is Mr. Ian H. Ogilvy, 9 Imperial Road, Windsor, Berks.

That Christmas Gift Problem

UNLIKE his womenfolk, who are apt to exhibit the symptoms of Christmas-gift buying before October is out, the average man is liable to postpone the task—for as such he usually regards it—until the last shopping-day before the holiday.

By way of a suggestion which may result in a few names of relatives and friends being ticked in the "must" list in good time we offer a reminder about some of the well-known diaries published annually by Iliffe journals, and now (or very shortly) available in their 1952 editions. In every case the little book is certain to please; all one needs to know is the intended recipient's particular interest or hobby. Among the diaries are:—

"*The Autocar*" *Motorist's Diary*. Sixty-four pages of reference material, 4½ in. by 3¼ in. In Morocco leather, 6s. 1½d, or 4s 3½d in Rexine.

"*The Motor Cycle*" *Diary*. Eighty 4½ in. by 3¼ in. reference pages. Morocco, 6s 1½d, Rexine 4s 3½d.

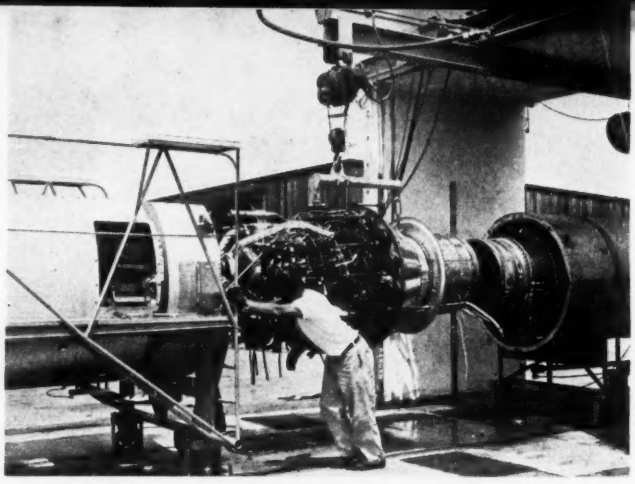
"*Yachting World*" *Diary*. Fifty-two 5¼ in. by 3¼ in. reference pages. Blue Morocco, 9s 2d, Rexine 7s 4d.

"*Amateur Photographer*" *Diary*. Fifty-seven 5¼ in. by 2¾ in. reference pages. Morocco 6s 1½d, Rexine 4s 3½d.

"*Wireless World*" *Diary*. Eighty 4½ in. by 3¼ in. reference pages. Morocco 6s 1½d, Rexine 4s 3½d.

All the above prices include purchase tax. The diaries are obtainable at booksellers and stationers, or from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London S.E.1.

HERE AND THERE



SPEED-UP: An Allison J-33 turbojet is hoisted for test installation in a "slave" fuselage at the Lockheed Burbank plant; beyond is the silencing duct which, like the fuselage, is trolley-mounted to facilitate the coupling-up process (see paragraph on this page).

The Royal Visit to Australia

SO extensive is the programme of visits to be made by Princess Elizabeth and the Duke of Edinburgh during their Australian tour that only air travel will make the itinerary practicable; between March 1st and May 1st they are to fly some 6,000 miles round the continent.

Woomera Rumour

SPEAKING in the House of Representatives last week, Mr. Beale, Australia's Minister of Supply, denied rumours that the British Government were thinking of transferring their rocket development work from the Woomera Range to America on the grounds that it had fallen behind schedule.

Its Weight in Gold

THE Canadian Minister of Defence Production, when handing over the first CF-100 to the R.C.A.F., remarked that the cost of one recent experimental American high-speed aircraft, at 35 dollars an ounce, was equal to its weight in gold. He was thankful to say that the CF-100 was produced considerably more cheaply.

R.Ae.C. Film Shows

AGAIN this winter the Royal Aero Club is to hold periodical film shows at Londonderry House. The first is on Thursday, November 15th, at 6 p.m., when *Southern Cross*—about Sir Charles Kingsford Smith and his famous Fokker monoplane—will be screened. On December 18th, the Howard Hughes 1914-18 war classic, *Hell's Angels*, will be shown. Tickets are available only through members.

Thin Spin

FOR the testing of high-speed airscrews, Aero-products Division of General Motors have developed a "spin pit" in which it is possible to rotate airscrews at maximum design r.p.m. for a minimum power input. This is achieved by evacuating the pit—actually a closed chamber—to any desired low-density condition; it is possible to reduce the density to an altitude-equivalent of 13,000ft. The power unit employed for rotation is a 450 h.p. Pratt and Whitney Wasp Junior which can, for short periods, rotate a given airscrew at 3,900 r.p.m. Future plans include the investigation of resonance frequency and blade deformation.

Hired and Fired?

"FLIGHT engineer (guided missiles). Applicant should be of degree standard" —from a "situations vacant" advertisement.

In a Worthy Cause

IN spite of its financial requirements for new premises, the R.A.F. Reserves Club has been able to present £801 to the R.A.F. Benevolent Fund. A cheque handed over last week to A. V-M. Sir John Cordingley, controller of the Fund, by Mr. W. F. Tuckwell, chairman of the Club, brought up to this total the proceeds of the Reserves Club Ball on October 19th.

"Slave" Test Bed

TO accelerate production of the two-seat Shooting Star variants F-94 and T-33, Lockheeds are pre-testing the Allison J-33 turbojets in an unserviceable fuselage—thereby cutting, it is claimed, as much as three days off the delivery-time of each aircraft. Stripped of wings and tail unit, the airframe is mounted on a track so that the tail pipe protrudes into a large efflux silencer. This supplants the previous practice of installing the turbojet on the assembly line and moving each complete aircraft to the run-up section. Obvious advantages of the new method include the ease with which troublesome engines may be replaced, the simplified fuel coupling system and the saving of space in the run-up area.

Bristol's North-East Venture

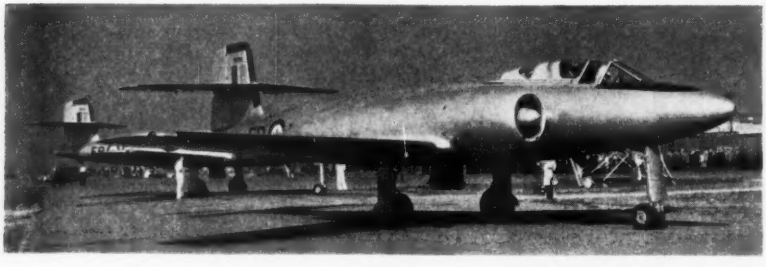
FROM Sunderland last week came news that a local trading-estate factory is to be taken over next month by the Bristol Aeroplane Co., Ltd., for gas-turbine manufacture. Six hundred workers will initially be employed, ultimately rising to 3,000.

Aneurin Answered

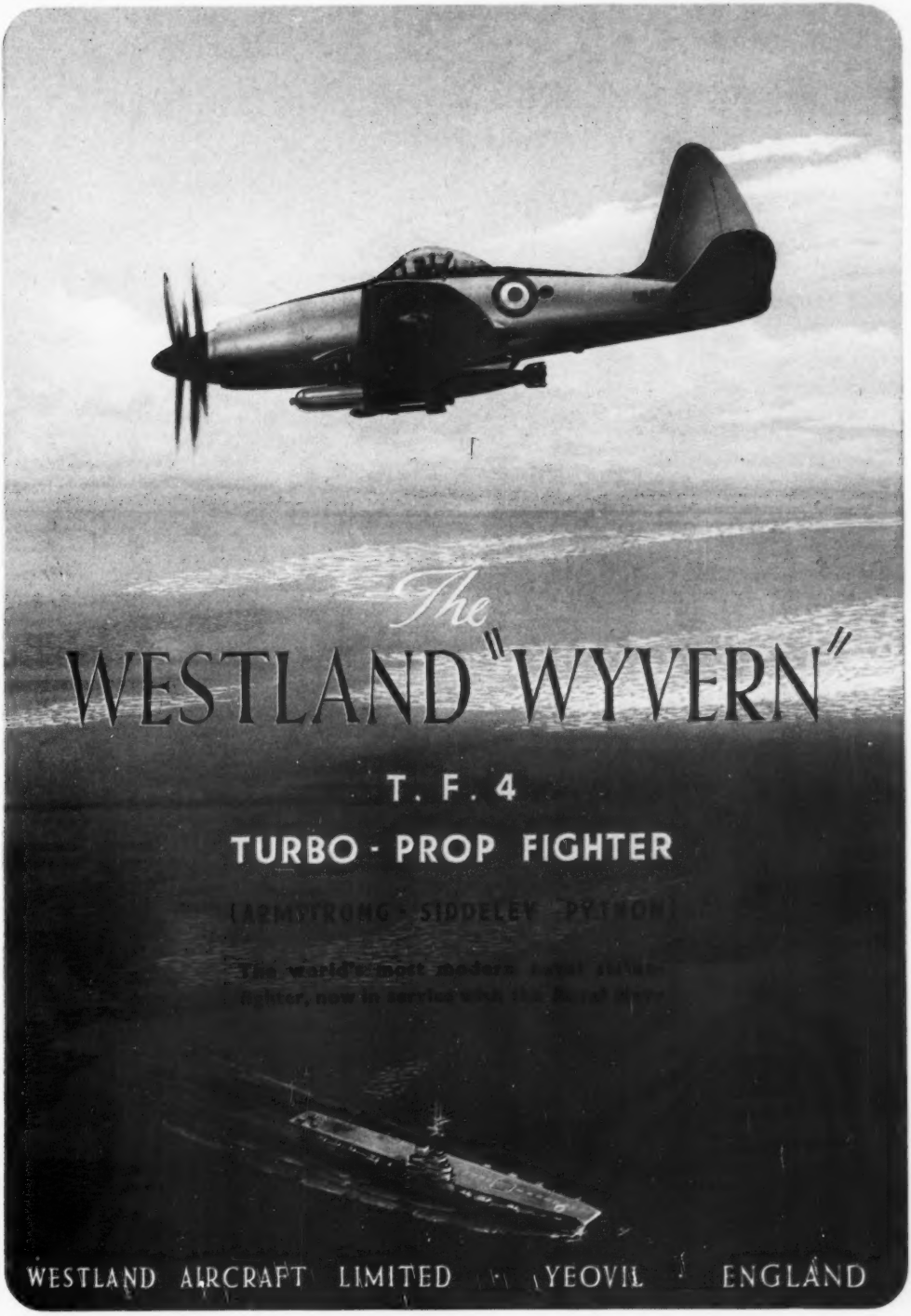
A SPEECH last week by Mr. Aneurin Bevan, in which he was reported to have said that Vickers, Ltd., paid their directors "£166,933, an average of £13,900," has brought a denial from the company. They state that the figure of £166,933 is taken from the consolidated profit and loss account for 1950, and represents the total sum paid to the 49 executive and non-executive directors of Vickers, Ltd., and subsidiary companies; the average figure on this basis is, they point out, £3,400 and not £13,900.

Bristol-Built Gift

PRESENTED to Greece by the Scottish Fund for the Children of Greece, a £12,000, 50-bed hospital, prefabricated in aluminium by the Bristol Aeroplane Company (Housing), Ltd., was opened in Athens recently by Queen Frederika of the



TO GUARD THE NORTH: Two of the four Avro Canada CF-100 long-range, all-weather fighters which are now on test. The Orenda-powered prototype nearer the camera was lately handed over to the R.C.A.F., which Service is standardizing on the type for the protection of Canada's frontiers.


The
WESTLAND "WYVERN"
T. F. 4
TURBO - PROP FIGHTER
WESTLAND AIRCRAFT LIMITED YEOVIL ENGLAND

Once a passenger has experienced the quietness and freedom from vibration aboard the Viscount, he will influence many another traveller's choice of airline. And the Viscount, besides being a source of goodwill and prestige, offers speed and exceptional serviceability

VICKERS VISCOUNT

FOUR ROLLS-ROYCE DART PROPELLER TURBINES

AF110

HERE AND THERE . . .

Hellenes. After the ceremony, Her Majesty was presented by the company with the golden key used for the formal opening. The entire building, in 130 cases, weighing 50 tons, was shipped from Weston-super-Mare.

Blown Home

ROTOR downwash is often considered an awkard characteristic of helicopter operation, but it was put to good use recently in San Francisco Bay : two children adrift on a play-raft were carefully "blown" to shore by a helicopter pilot.

New Oil from Old

IT is claimed that about a million gallons of used aircraft lubricating oil have been reclaimed for U.S. Air Materiel Command during the past year by a special "re-refining" process said to yield an oil equal in every respect (and superior in some) to the original lubricant.

SOVIET CLOSE-UPS : Portraits of Russian pilots seldom reach this country nowadays. The two here are amateurs who have recently broken records in various F.A.I. categories; on the left is N. Golovanov, with a Yak advanced trainer comparable with the Harvard but of greater power, while on the right is Vladimir Panchenko, with a Yak-18.

MR. CRAWFORD GORDON, Jnr., who, as recently announced, has been appointed president and general manager of A. V. Roe Canada, Ltd.

Big Douglas Contracts

DOUGLAS AIRCRAFT have given a contract of several million dollars' value to the Plymouth Division of the Chrysler Corporation for the building of complete tail units and outer wing sections of C-124 Globemaster IIs. The tail unit measures 50ft to the tip of the rudder and has a span of 45ft. Another big Douglas contract goes to the Texas Engineering and Mfg. Co., of Dallas, for A2D Skyshark major sub-assemblies.

IN BRIEF

A NEW façade will transform the war-time frontage of the Castle Bromwich, Birmingham, section of the British Industries Fair. Next year the Fair is being held from May 5th to 16th.

* * *

The British Aluminium Co., Ltd., announces that Mr. R. M. Warrington is shortly relinquishing his position with the company as assistant sales manager and will be succeeded by Mr. S. M. Lawrence, formerly responsible for the technical service section of the development department. Mr. O. M. Bruce Payne succeeds Mr. Lawrence.

* * *

When Lord Ogmore, Minister of Civil Aviation, and Sir Arnold Overton, Permanent Secretary, M.C.A., paid their recent visit to Cowes to see the Princess flying-boat they landed at Isle of Wight Airport, Sandown. There they were met by Capt. E. D. Clarke, M.C., and other executives of Saunders-Roe, Ltd., accompanied by Miss Mary Wilkins, the airport manager.

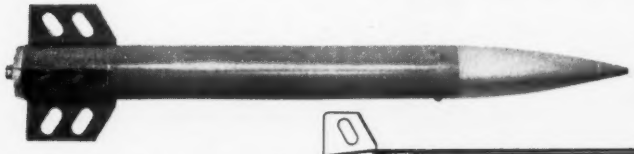
* * *

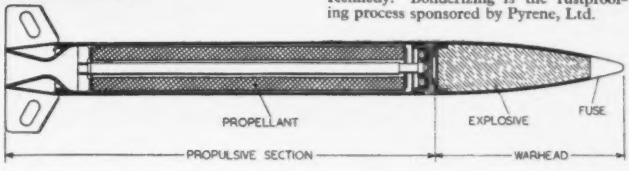
Guests of honour at the recent dinner of the Aerauto Association in London were Hugh Kendall, winner of the recent *Daily Express* Race, and John Heath, designer and producer of H.W.M. racing cars. Members of the Aerauto Association are old boys of the College of Aeronautical and Automobile Engineering, Chelsea; Hugh Kendall was an aeronautical student there in 1934-7 and John Heath took an automobile course in 1933-4. The Association has recently introduced a technical information bureau for the use of ex-students, particularly those abroad.

NEW V.H.F. EQUIPMENT : Well known in the radio and electrical industry, Burndept, Ltd., of Erith, Kent, have produced this 10-watt V.H.F. transmitter for the M.C.A. Intended for air-traffic control on 117-133 mc/s, it consists of rack-mounted, mains-operated equipment divided into power and R.F./modulator units. Overall dimensions are 21in x 19in x 16in.

* * *

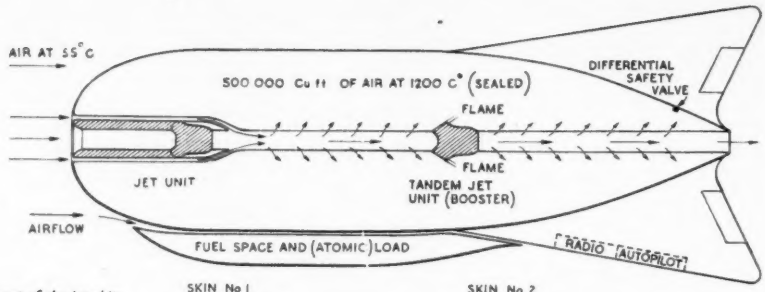
Claimed to be the largest aerial banner (68ft by 7ft) ever flown, the slogan "Demand Bonderized Cars" was towed over the Earls Court Motor Show last week by a Gemini piloted by Hugh Kennedy. Bonderizing is the rustproofing process sponsored by Pyrene, Ltd.





INSIDE INFORMATION on the 80 mm Oerlikon rocket projectile—a group of which, mounted on a Mustang, was depicted in our issue of October 5th—is provided by the sectioned drawing on the right. The photograph shows a slight variation of the projectile.

By
Capt. L. ARTHUR,
D.F.C., F.R.Met.S.,
A.R.Ae.S.



Suggested general arrangement of the jet-ship (length 240ft, maximum diameter 60ft). Operating through an autopilot, the radio equipment would adjust direction, speed and altitude, and could also fuse the war-load.

MODERN MONTGOLFIER

Theoretical Outline for a Jet-heated, Jet-propelled, Hot-air Dirigible Weapon

THIS article propounds the concept of a military aircraft, the design of which is so startlingly at variance with contemporary lines of thought—at least those in common currency—that it arrests the attention. The author's theoretical examination is so sound as to suggest that such an aircraft could undoubtedly be built and be made to work, but whether it will, in fact, ever be built is quite another matter. This would seem to rest chiefly upon the operational philosophy, which is more questionable.

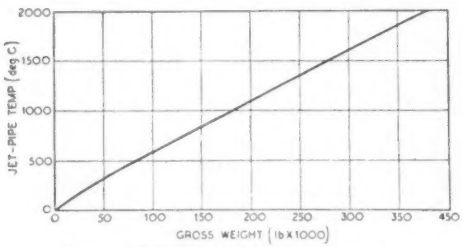
PERHAPS the jet airship has already been seen—it would not surprise the writer; but in case there is any doubt about its practicability, these notes on the subject may bring forth some interesting facts for consideration.

Before going further, let it be clearly understood that, unlike the helium dirigible, this airship lends itself to high-speed, high-altitude work. It could carry a bomb-load; it could hover over a threatened country, or move away at high speed. As a "diplomatic" weapon, with atomic bomb-loads, it could hardly be shot down over the country over which it hovered; the only answer would be to evacuate or submit to an awaiting army. It is also a possible checkmate to war as at present envisaged.

The hot-air principle is not unknown to aviation historians, and no doubt it is a great pity that the Montgolfiers were without the heat-energy of the Whittle turbojet. By studying the laws of gases, the volume occupied by air heated above standard temperature can be assessed. Thus the displacement theory can be used to show the weight of the displaced air and hence the total lift in pounds —

$$V_1 = V_0 \frac{T_1}{T_0} \frac{P_0}{P_1}$$

Raising 1,000 cu ft of air to 1,000 deg C (1,832 deg F) with pressure constant at 29.92in Hg (a purely theoretical pressure condition), it will be found that the new volume V_1 is about 4,400 cu ft. Therefore lift at 1,000 deg C on 1,000 cu ft is 0.076 (4,400)—76 lb at sea-level.



Hot-air cell (500,000 cu ft) lift versus temperature.

The inverse-density law is used to discover the pressure attitude of a lighter-than-air vessel, and in this case the relation has become 0.227. This is equivalent to an altitude of 41,000ft.

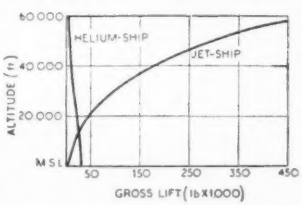
At this point, 41,000ft, the differential pressure would be zero, so that pressure in the balloon would be 5.283in Hg. Correction for pressures is made to the figures for constant pressure as follows :—

$$\text{Lift at } 41{,}000\text{ft} = 0.02175\ (4{,}400 \times \left[\frac{29.92}{5.283}\right]) - 76$$
$$= 465 \text{ lb}/1{,}000 \text{ cu ft}$$
$$\text{Lift at sea-level} = 0.076 \times 4{,}400 \text{ (nil press. differential)}$$
$$= 334 - 76 \text{ lb}$$
$$= 258 \text{ lb}$$

Lift/1,000 lb versus Temperature in Envelope

Deg C	V°/V	Alt (ft)	Lift (lb)
2,000	0.12	55,000	760
1,500	0.16	50,000	560
1,000	0.23	41,000	460
500	0.37	30,000	175
250	0.53	20,000	75
100	0.78	8,000	30
50	0.89	4,000	12
15	1.0	0	0

In practice, of course, a differential pressure exists in an envelope until the pressure altitude is attained, and the lift in pounds will remain constant as the differential pressure reduces, up to the altitude selected.



Lift comparison between normal helium-filled ship and jet-heated ship.

The capacity of the ship chosen here is only that of 500,000 cu ft. The dimensions would be : length, 240ft; maximum diameter, 60ft. The highest temperature commensurate with technical and metallurgical progress would be 1,000 deg C to a maximum of 1,500 deg C. At 1,200 deg C the ship would lift a 230,000-lb gross weight to 41,000ft.

For military purposes payload need only be about 20,000 lb (9 tons). One or two turbojets of 5,000 lb thrust would result in a speed of (*a*) 250 m.p.h. (single jet), or (*b*) 360 m.p.h. (twin jet) at 50,000ft.

Structure would consist of an inner envelope of tungsten-steel plating overlaid by asbestos, then finally covered by sheet aluminium. With a total surface area of 45,000 sq ft, the envelope weight-estimate would be approximately :—

	lb
Inner steel sheath, 24g	40,000
Asbestos "sandwich" C.10	9,000
Outer cover Al.18G	31,000
	80,000

The engines and accessories could be expected to weigh :—

	lb
Engines and ancillaries	10,000
Structural weight (bracing, etc.) ...	90,000
Military load	20,000
Fuel, radar, etc....	30,000
	150,000 lb

∴ Gross weight = 150,000 lb + 80,000 lb = 230,000 lb

As a disposable unit of attack, rocket motors might perhaps be applied. As a means of passenger transport the device obviously has no future, but as a weapon it is unlike anything science has yet supplied for strategic warfare. The use of the turbojet to supply heat for altitude and, later, thrust, hardly strains the imaginative designer's brain; it is a very simple matter.

Range at 50,000ft and 1,500 deg C would be 1,800 miles (22-ton load), or at 40,000ft and 1,000 deg C 4,320 miles (9-ton load).

As a purely theoretical approach the argument does not consider the problem of fuel-storage in relation to such heat. But isolation is possible, and without a doubt every possible combination of practical engineering facts leads to the belief that something of this kind may already have been designed, or even produced; in fact, the author is of the opinion that some pilots have even seen such a device.

It is not a fantasy—it can be manufactured here in England or any other country. It is a fact that one country, Russia, has never abandoned the study of lighter-than-air craft, nor has the U.S. Navy. It is by no means an exhausted subject, and this article is an attempt to show that consideration of the jet-ship in the stratosphere is not an idle study.

DIRECTOR-GENERAL OF ELECTRONICS

AN important new post at the Ministry of Supply, that of Director-General of Electronics, is to be filled by Mr. N. C. Robertson, deputy managing director of E. K. Cole, Ltd., whose products in the radio and electronic fields are well known. He will take over his new duties, which are on a voluntary basis, early this month. Mr. Robertson will be responsible for the production of all radio, radar, telecommunication and electronic equipment for the Ministry. The creation of this directorship was announced in the House of Commons on July 23rd, following recommendations made by the Select Committee on Estimates.

Mr. N. C. Robertson.

Mr. Robertson, who is 43 years of age, has been connected with the radio industry since 1924, when he was apprenticed to the Sterling Telephone and Electric Co., Ltd. From 1926-28 he was an engineer with Marconi's Wireless Telegraph Co., Ltd., and from 1928-30 chief inspector with Kolster Brandes, Ltd. In 1930 he joined E. K. Cole, Ltd., with whom he has been successively chief inspector, production manager, works manager, director (since 1943) and deputy managing director (since 1945).

He has been closely connected with the production of radar equipment from its very early stages. He was awarded the M.B.E. in 1944. In his new post, the Ministry will undoubtedly benefit from his long technical experience in this country and from his knowledge of production methods in America and on the Continent.

Mr. Robertson is a Fellow of the Royal Society of Arts and an Associate of the Institution of Electrical Engineers.

HOLLYWOOD HOLOCAUST

GEORGE PAL, who was responsible for *Destination Moon*, a film with considerable scientific and technical fidelity, has now made an even more ambitious picture called *When Worlds Collide*. Unfortunately, however, the latter film is not in the same class as its forerunner; technically, it is slapdash by contrast with the unusually high standard of *Destination Moon* and, of course, the subject-matter of the story is really far too immense in scope for portrayal even by the untrammelled resources of modern film-making.

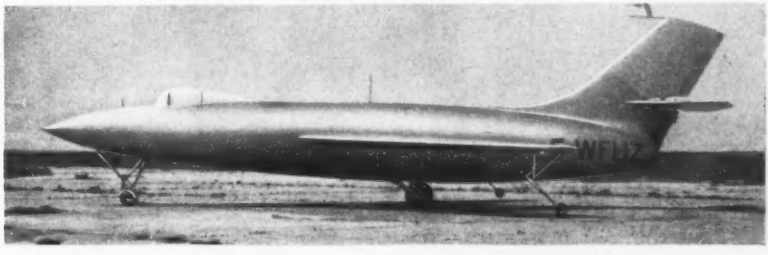
The result is that the film, *When Worlds Collide*, even although it at times arrests one's attention by the pure spectacle of some of its scenes, nevertheless fails at any time to convince. This failure must not be attributed to the cast, who are, if not outstanding, competent enough.

There is little of genuine aeronautical interest in the film, although shots of a helicopter are quite impressive.

French Research Glider

THE Arsenal 2-301, illustrated on this page, is a full-scale replica of a supersonic project and has been flying for some time at Orleans-Bricy and, more lately, at Melun. The glider is towed by a DC-3 or NC-702, and is used for making measurements in free flight during eight-minute glides from 16,400 ft. Construction is of wood and a special three-point wing-attachment system has been evolved to enable wing-sets to be changed quickly. The wings are very heavily swept and have a thickness/chord ratio of only 10 per cent. The aileron chord is 20 per cent, and flap chord 11 per cent, of the total chord. The tailplane is adjustable in flight and the tandem undercarriage consists of a fixed main wheel, retractable nosewheel, and small wingtip wheels. The nosewheel is steerable and the main wheel has brakes. An extensive range of recording and telemetering equipment is carried.

Principal characteristics of the Arsenal 2-301 are: span, 29ft 7in; Length, 41ft; wing area, 219.6 sq ft; aspect ratio, 4; sweep at 25 per cent chord, 45 deg; dihedral, 0 deg; max. fuselage diameter, 5ft 5in; tailplane area, 49.73 sq ft; weight empty, 2,645 lb; gross weight, 2,980 lb; minimum speed, 81 m.p.h.; maximum speed, 217 m.p.h.



The Arsenal 2-301 experimental glider.

The photographs on this page show (top, left) the Princess arriving at Londonderry House; (centre) a charming impression of Her Royal Highness in conversation with A. Cdre. Whitney Straight; and at foot of page the presentation, by Lord Brabazon, of "Fellowship of the Air"—the history of the Club—and the jubilee copy of the "Royal Aero Club Gazette."

THE JUBILEE BALL

AS befitted the celebration of such an occasion as a fiftieth birthday, the Jubilee Ball of the Royal Aero Club, at Londonderry House on Wednesday of last week, was an outstanding success, on which the gracious presence of H.R.H. Princess Margaret as guest of honour set the final seal.

Though filled to capacity, the ballroom was not uncomfortably crowded, and only the delays which some guests experienced in obtaining supper underlined the fact that some 500 were present.

Princess Margaret's party were entertained principally by Club committee members, including, of course, Lord Brabazon, A. Cdre. Whitney Straight and Col. Preston. Prince Alexander of Yugoslavia and Mr. John Cunningham were also among Her Royal Highness's dancing partners.

A telegram of good wishes was received from His Majesty the King, and messages also came from, among others, the Royal Aero Club of Greece, and Lloyds aviation underwriters. During the course of the evening the Princess accepted, from the hands of Lord Brabazon, a specially bound copy of *Fellowship of the Air*—the Club's history, written by B. J. Hurren—and a special Jubilee copy of the *Royal Aero Club Gazette*.

The presentation copy of "Fellowship of the Air" was bound in blue Niger leather blocked in gold and palladium

Impressions of modern aircraft

THE FAIREY GR-17

Equipped with Lockheed engine-driven pump, and cut-out valve—the 'heart' of the hydraulics.

ALL-BRITISH Lockheed

REGD. TRADE MARK

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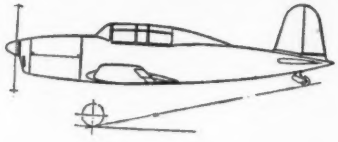
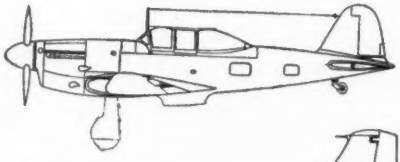
FIAT TRAINING AEROPLANES

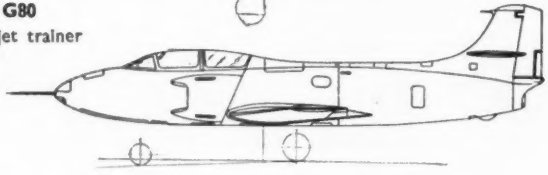
FIAT G46 Primary and basic trainer



FIAT G59
Advanced trainer



FIAT G80
Turbojet trainer



The three FIAT training planes that satisfy the latest technical and flying requirements for the basic and advanced training of pilots.

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BOMB-RUBBLE INTO RUNWAY

A Salt-Marsh Landing-Strip : How Corfu's Airport was Built

THE first airfield ever constructed on Corfu—one of the largest and most densely populated of the Greek islands—now links this major tourist attraction with Athens and other cities of the mainland.

On a seemingly bottomless salt swamp only a five-minute car ride from the town of Corfu, the airfield was built with the bomb rubble of the old city. A smooth asphalt runway, 32 metres wide and 1,260 metres long, runs across the swamp and projects a third of its length into a shallow lagoon.

The story of the runway is one of drama, work and force of will, in keeping with the island's turbulent and dramatic history that goes back 2,000 years; for Kerkyra, as historians now spell the name of the ancient city, has been in the news consistently since a quarrel with its mother city, Corinth, launched the Peloponnesian Wars.

The island has gone through Roman, Venetian and Frankish occupations, and for a time was governed by Britain until it was handed over to Greece in 1865. It attained renown as an idyllic rest-spot for royalty and moneyed tourists.

Then, in 1941, the first bombs of the Greek war fell on Corfu, when the Italians hit the island at the start of their abortive invasion through Albania. By an irony which the Greeks still relish, the first bomb fell squarely on an Italian school. Later, Corfu was bombed again, many times, until it was occupied by the Italians, after help from the Germans. Then British and American aircraft worked-over the docks and port areas, and sank a number of Italian ships just offshore, where the rusting hulks still remain. But the worst experience came in 1943, when the Nazis conducted a mass spite raid to express their displeasure over Italy's defection to the Allies.

The Final Blow

That German raid nearly wiped out Corfu. The ancient, packed city, medieval in construction, fell apart into the narrow, twisting streets and alleys. When the German raiders departed, a third of the houses were destroyed and the remainder badly damaged.

There were no lorries or steam shovels available; so for two years the city piled its rubble in the roofless cubicles of walls still standing. By 1945, there were more than 100,000 separate piles of rubble carefully stacked in such enclosures or piled high on street corners, while rats and other vermin ran wild. Eventually, four lorries began hauling the debris away. Later the trucks became nine, working day and night.

Where to put the rubble? The swamp was the answer. It was conveniently situated; moreover, for many years the city planners had dreamed of filling in this area for an airfield. So among their first acts in 1945, the City Fathers asked the Greek Air Ministry for an engineer to show them just how to place the rubble to facilitate airfield construction later on.

The rubble was laid in a seemingly bottomless salt marsh on the city's outskirts, and eventually the runway extended by nearly a third of its length into a shallow bay.

During the next few years the government allocated about £300,000 for the project, including work relief funds to the Corfu unemployed who were shovelling up the remains of the city. By early 1949, 800 metres of runway were ready—built on top of 33,000 truckloads (80,000 cubic metres) of rubble. More funds were allocated to extend the field and gravel-surface it. Then, in 1950, engineers studied the strip and determined that it needed 1,260 metres of asphalt-surfaced runway to comply with international aviation regulations. They decided that the asphalt strip should be at least five centimetres thick to handle commercial transports, and 32 metres wide, with another 27 metres of the gravelled strip on each side of the asphalt, hard-packed enough to take the weight of a large aeroplane.

Already, however, the runway had had customers and saved lives. In December, 1949, a U.S. Air Force C-47, *en route* from Athens to Italy, ran into heavy head winds and stormy weather. Over Italy ice was added to the pilot's troubles, so he turned about and headed back for Athens. Fuel shortage, however, compelled him to put down, at night, on the unfinished Corfu strip, lowering the wheels by hand and using emergency braking.

Rubble Hunt

It had been figured that an extra 30,000 cubic metres of rubble would be needed to fill in the swamp for the required extra length; but before the job was finished, another 55,000 cubic metres had to be used, as the swamp was so soft.

"We didn't precisely run out of rubble," said the engineer in charge of the project, "in fact, we are still cleaning up Corfu to this day. But we had to scrabble around in order to fill in the runway out into the lagoon."

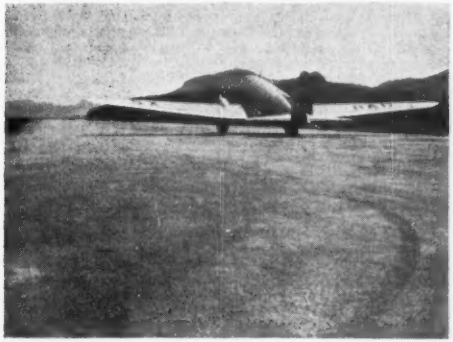
Today the runway is complete and the field in operation—although the passenger station is only a tent, and plans for a modern air terminal and control tower and met. station are still only blueprints.

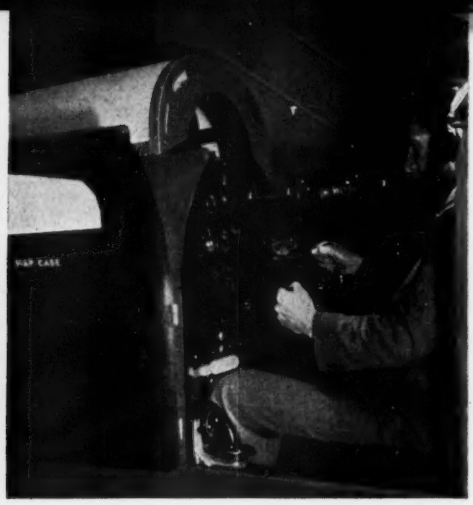
Previously the trip to Athens, by sea, required about 30 hours. Now the DC-3s of the Greek Airlines, T.A.E., land daily and Athens is only an hour and a half away. Tourist traffic is increasing rapidly, as the air fares are cheap—about £11 for the return trip from Athens.

"But the thing that encourages us most," said an official, "is that the arriving aircraft are not confined to tourists. Each one also carries several old countrywomen or village patriarchs." These are people who only a few years ago had never ridden anything but a donkey. This traffic provides a measure not only of Corfu's close links with the rest of Greece, but also of progress into twentieth-century methods. It is a real symbol of a proud future for Corfu.

R. B.

A DC-3 takes off from the smooth, unmarked surface of the new strip.





The special Link Trainer, Type AT-20, which has been produced to meet the requirements of Australian National Airways. It is seen installed at Essendon Airport, where instructional courses have commenced.

AUSTRALIAN D.M.E. TRAINING

Provision in New Link Equipment for A.N.A.

As was recently reported in *Flight*, distance-measuring equipment is being installed at 89 stations along Australia's main air routes, so pilot-training in its use—and particularly in its integration with other navigational and landing aids—has become a matter of considerable importance.

Provision for such training has been incorporated in a new Link Trainer specially designed and built for Australian National Airways by Air Trainers, Ltd., of Aylesbury, Bucks. A.N.A. engineers, it is reported from Australia, contributed to the design of the equipment.

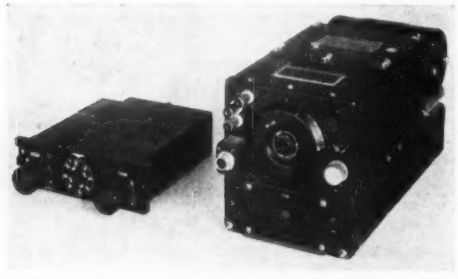
The comprehensive instrument panel of the AT-20 Trainer, as the new type is known, includes an automatic instrument-landing system localizer (I.L.S.), automatic visual and aural range (V.A.R.), automatic medium-frequency radio range, automatic two-course radio range, distance-measuring equipment, automatic and manual radio-compass facilities, and communication fittings.

The AT-20 differs radically from existing Link Trainers used by A.N.A. and other companies in Australia, by reason of the fact that, apart from the additional instrumentation specified above, there is provision for simulating a number of hazards, such as engine failure caused by incorrect handling on the part of the pilot.

A.N.A. pilots, flight engineers and ground staff have now started courses on the AT-20, which has been installed at the company's Link school at Essendon Airport.

MULTUM IN PARVO

With the use of more and more equipment within the limited stowage space available in modern aircraft, particularly military types, reduction of component size has become increasingly important. As a result of a programme initiated at the U.S. National Bureau of Standards, a new 12-tube sub-miniature "radio range" receiver with a bulk of but 55 cu in has been developed. The receiver is continuously tunable from 190 to 550 kc/s with an intermediate frequency of 135 kc/s; it has a sensitivity of five micro-volts for a six decibel signal-to-noise ratio, and a power output of 100 milliwatts. The 12 valves provide two tuned radio-frequency amplifier stages, a mixer, a local oscillator, two 135 kc/s intermediate frequency amplifiers, a diode detector, an a.v.c. diode, a beat-frequency oscillator, an audio-amplifier stage, and a push-pull parallel power output stage. All stages operate with 26 volts D.C. on heaters, screens and plates. Under these conditions of operation four sub-miniature audio power-output valves are required.



The new U.S. sub-miniature low-frequency radio range receiver (left) alongside the equivalent unit it is designed to replace.

ALL ABOUT ICELAND

A new Iceland tourist information bureau has been opened at 6B, Princes Arcade, Piccadilly, London, with the intention —as Mr. G. Jonmundsson, who will be in charge, said on the opening occasion on October 23rd—of destroying the old-fashioned notion that Iceland is a land of Eskimos and igloos. It seems that many British and European tourists seeking an off-the-beaten-track holiday have enjoyed visits there in the last five years. The attractions include the midnight sun, geysers, volcanoes, glaciers and excellent salmon fishing. Two pleasant colour films were screened after the opening ceremony.

The new tourist bureau has been set up by Iceland Airways, the Iceland Steamship Co., Ltd., and Iceland Tourist Bureau. Messrs. Johnson, Möller and Thordarson respectively represented these concerns and the Icelandic Minister in London was present.

Iceland Airways, with headquarters in Reykjavik, operate both internal and international services. The internal services serve 17 areas in Iceland, while DC-3 and DC-4 services are run to Copenhagen and London. The company also operates five amphibians and other light aircraft. A second company, Icelandic Airlines, which at one time also operated to this country, Denmark and America, has now restricted its operations to internal services.

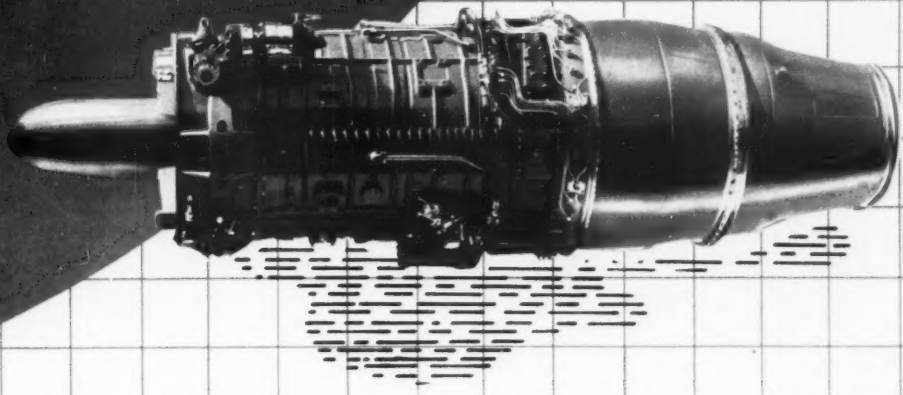
ARMSTRONG SIDDELEY GAS TURBINE DEVELOPMENT

annular combustion chamber

simplicity of design and manufacture

small frontal area

lower fuel consumption



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VAMPIRE F. B. MARK 5

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SEA VENOM

The VENOM 2 Night Fighter

Unsurpassed in climb, in endurance, in manœuvrability at altitude and in cockpit layout, the Venom 2 night fighter with the de Havilland Ghost jet engine materially advances the effectiveness of Britain's defence by night.

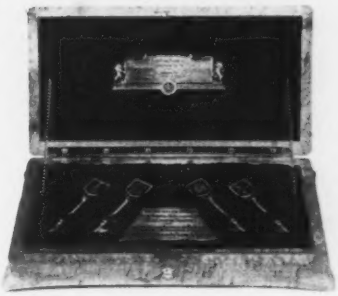
DE HAVILLAND

D'H AIRCRAFT

D'H ENGINES

The Canadair C5 of the R.C.A.F. in which the Royal couple left Trenton after the ceremony.

Shown in their maple casket are the four hand-wrought silver keys to Trenton presented to Princess Elizabeth.



ROYAL VISITORS AT TRENTON

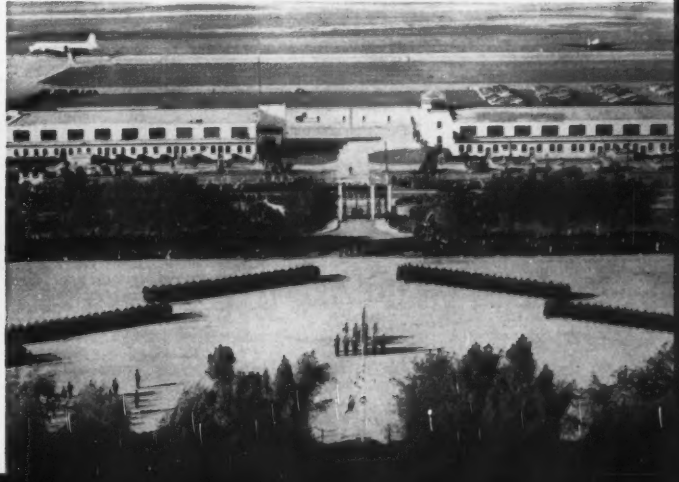
MORE than 700 officers and men of the Royal Canadian Air Force were on parade when Princess Elizabeth and the Duke of Edinburgh visited the R.C.A.F. station at Trenton, Ontario, on October 12th. The men were drawn up to form a V and the whole parade was in the charge of G/C. C. P. Dunlop, A.F.C., with W/C. W. B. M. Millar as his second-in-command. The King's Colour and the Colour of the R.C.A.F. were both carried, borne respectively by F/O. S. Woolley and F/O. D. C. McLeish. The King's Colour was presented to the R.C.A.F. on Parliament Hill, Ottawa, in June, 1950.

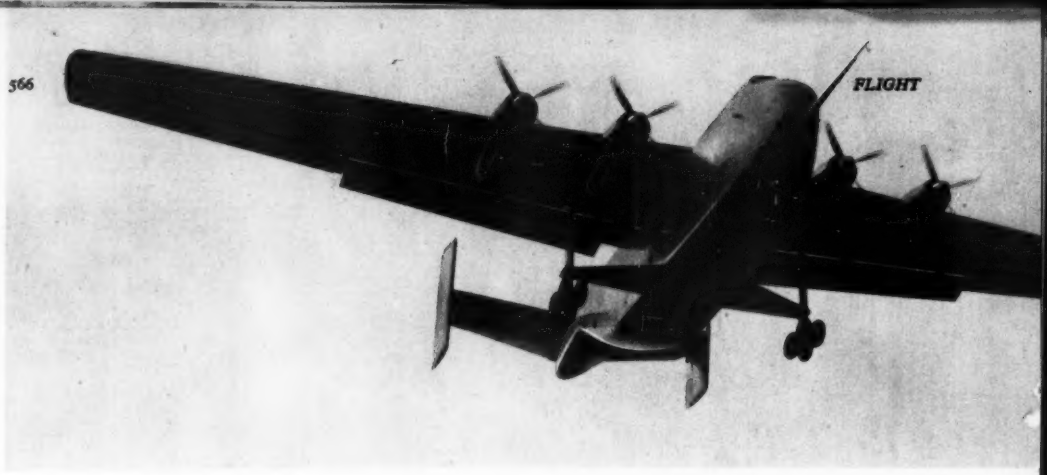
The band of Training Command and a trumpet band of volunteer bandsmen from Trenton and Borden played during the ceremony.

At the conclusion of the inspection, A.V-M. C. R. Slemon, C.B., C.B.E., presented the Royal visitors with four silver keys to the memorial gates to Trenton. The keys were contained in a casket made of Canadian bird's-eye maple lined with Safari sealskin and the loops of each fashioned as an emblem of either Great Britain, Australia, Canada or New Zealand, and each unlocks its own country's portion of the memorial gates, which were presented to the Royal Canadian Air Force in appreciation of the vital part played by Canada in the Commonwealth aircrew training scheme of the last war. During the five years the scheme was in operation no fewer than 131,553 aircrew were trained. Of these 49,808 became pilots and 29,963 navigators.

The keys, made from a solid block of silver, were wrought and chased by Mr. Lamb, a Birmingham silversmith, who has been resident in Canada for the past 29 years. During the war he was at an R.C.A.F. repair depot.

(Above) The Royal party, headed by Princess Elizabeth and G/C. Dunlop, pass through the memorial gates at Trenton. (Below, left) Inspection of the R.C.A.F. guard of honour commanded by F/L. J. M. Wicken. (Right) A general view of the parade ground at Trenton during the ceremony.



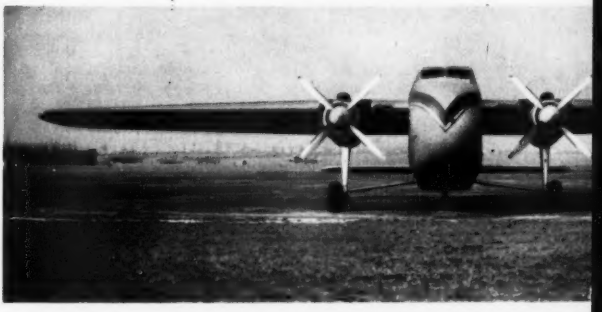


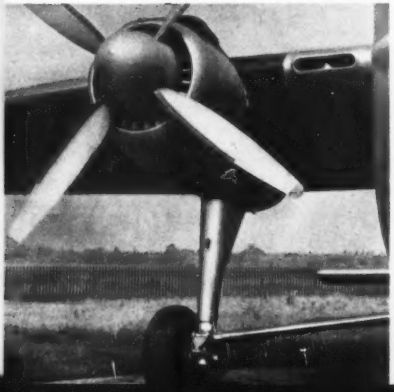
FIVE BRITISH MILITARY TRAN

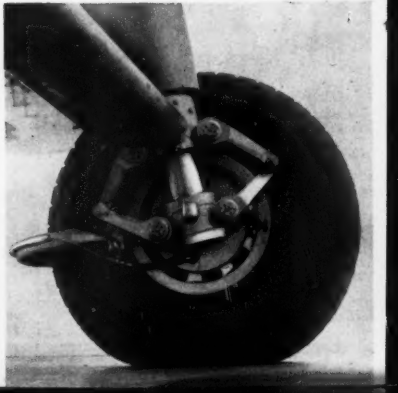
The "bridge" of the Blackburn and General Aircraft G.A.L. 60 (the aircraft is seen approaching in the uppermost picture), showing that the first pilot (port) at present has special test equipment for measuring hand and foot loads, whereas the second pilot has the standard control units.

On the right is the Bristol 170 Mk 31, as adopted by the Royal Canadian Air Force. Points to note are the oil-coolers in the leading edge and the new long-span tailplane.

WITH public interest focused on military transport aircraft by the prevailing tension overseas, it seems appropriate to depict the five types now in service or under development in this country. Mainstays of the R.A.F. Transport Command fleet are the twin-engined Valettas and four-engined Hastings, supplemented by a quantity of elderly Dakotas and Yorks, for which the Valetta and Hastings, respectively, were ordered as replacements. The Bristol Type 170, in the same general class as the Valetta, is not a standard R.A.F. type, though it is in service with the R.C.A.F. and other air forces and with numerous civil operators. It has an advantage over the Valetta and Hastin vehicles and bulky comparative ease. Blackburn and Gen military transport, advanced in its t Centaurus-engined have yet been recei chronological order the S.B.A.C. Displ size, is the Auster cribed as a single-en







Vickers-Armstrongs Valetta, standard twin-engined R.A.F. transport (two Bristol Hercules engines).

SPORTS

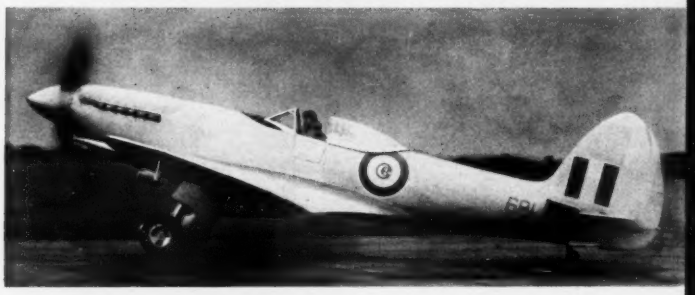
s in that the nose is hinged, allowing tores to be loaded and unshipped with asy loading is likewise a feature of the ral Aircraft G.A.L.60, Britain's largest one prototype of which is now well ting programme. A heavier, larger, evelopment is projected, but no orders ed for any aircraft of this class. Last in the prototype having first appeared at this year), and by far the smallest in mbulance/Freighter, perhaps best des- ined diminutive of the great G.A.L.60.

Handley Page Hastings, standard four-engined R.A.F. transport (four Bristol Hercules engines).

Auster Ambulance/Freighter (Cirrus Bombardier engine), seen camouflaged for Exercise "Surprise Packet."

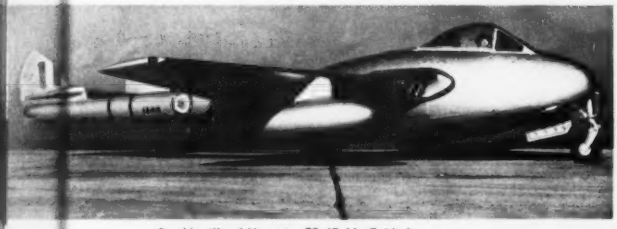
The Bristol 170 Mk 31 close-ups on the left show (l. to r.), the installation of the Hercules 734 engines (2,000 h.p. for take-off) and the new leading-edge oil-coolers; the starboard nacelle, with the pressure head for operating the automatic coarse-pitching mechanism on the left of the picture; and the new, strengthened, undercarriage unit, which allows operation at greater all-up weight than formerly.

Upper right: Hawker Fury 1 (Bristol Centaurus).
Lower right: Vickers-Supermarine Spitfire 22 (Rolls-Royce Griffon).



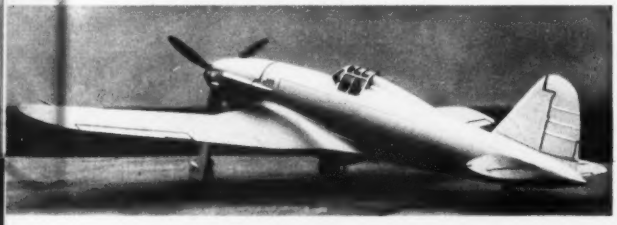
EGYPT'S FIRST LINE

Types of Aircraft in Service with the Royal Egyptian Air Force



De Havilland Vampire 52 (D.H. Goblin).

Fiat G.55 (Fiat-built Daimler Benz DB605).

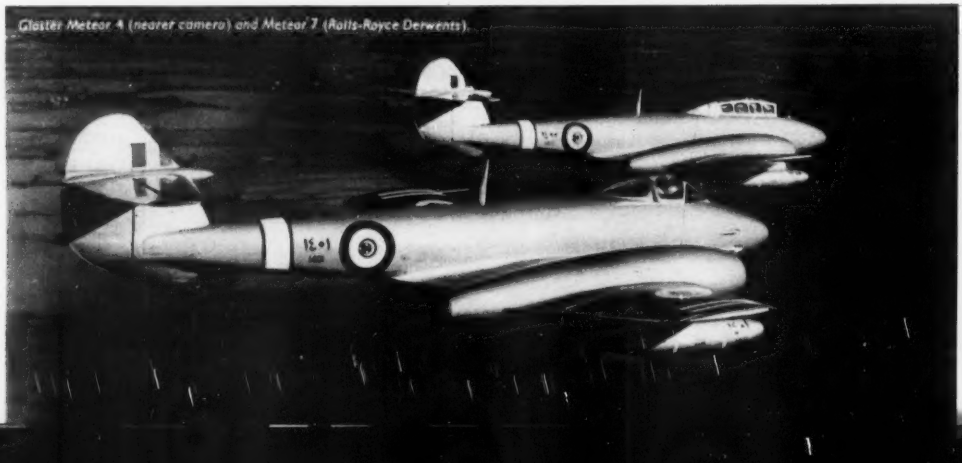


THE fighter, fighter/bomber and bomber/transport squadrons of the Royal Egyptian Air Force, now in many people's minds, if not actually in the news, are equipped with a heterogeneous collection of British and Italian aircraft. The oldest fighters in service are the Supermarine Spitfire 9s and Fiat G.55s, of comparable performance. Of more recent vintage are the Centaurus-engined Hawker Fury 1s (similar in performance and armament to our Royal Navy Sea Furies, but without the special naval equipment), and the Vickers-Supermarine Spitfire 22s (Rolls-Royce Griffon), twenty of which, drawn from Government stocks and reconditioned, were sold last year. Latest of all are the de Havilland Vampire 52s (Goblin) and Gloster Meteor 4s (Derwents). For training, a few Meteor 7s are available.

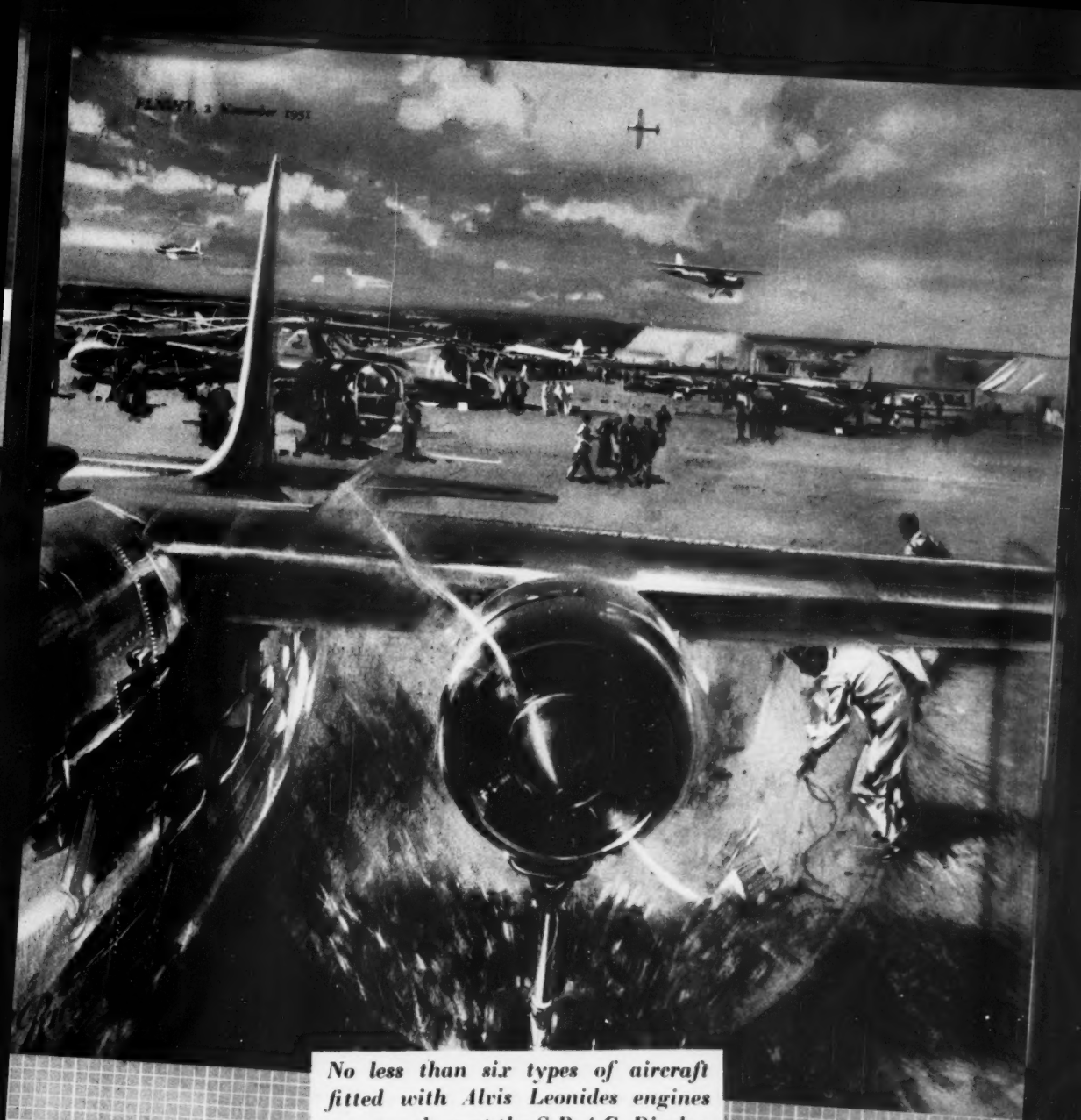
Impressed by the performance and simplicity of the Vampire Night Fighter, introduced at the S.B.A.C. Display in 1949, the Egyptian authorities were quick to place an order for a quantity of these machines, and had this been met the Royal Egyptian Air Force might well have had jet night fighters in service before the R.A.F.

For transport operations Dakotas, Curtiss Commandos, Short Stirlings and D.H. Doves are available, the Dakotas and Stirlings being equipped to operate as bombers if required. Ansons, Harvards and Magisters serve as trainers.

The national markings of the Royal Egyptian Air Force are roundels on wings and fuselage, and fin flashes. The colours are green and white, and the "bull's-eye" of the roundels contains the crescent-and-stars emblem.



Gloster Meteor 4 (nearer camera) and Meteor 7 (Rolls-Royce Derwents).



No less than six types of aircraft fitted with Alvis Leonides engines were on show at the S.B.A.C. Display

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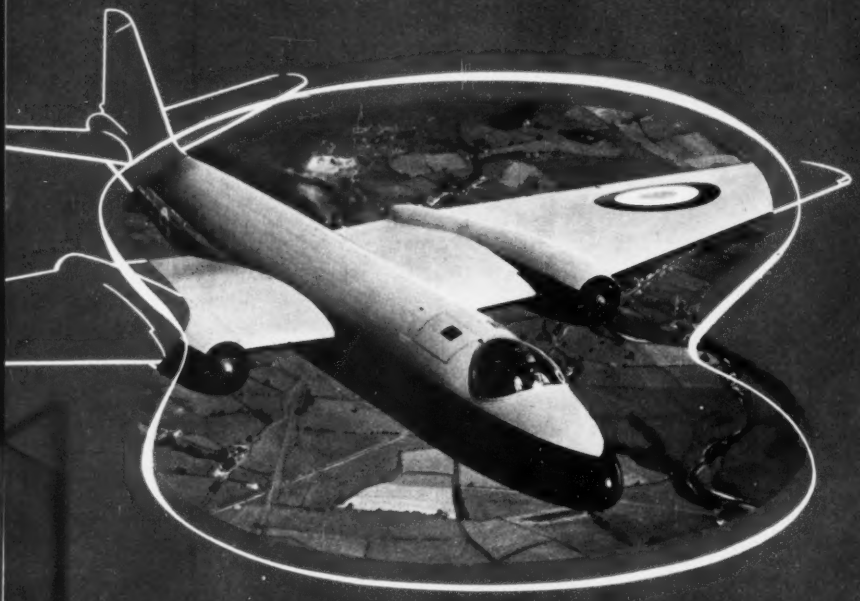

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FIVE NEW BOOKS

The Finest Möhne Dam Story : Freighting : Met. for All : Rommel Again : Airmails

"The Dam Busters," by Paul Brickhill; with a foreword by Marshal of the Royal Air Force Lord Tedder, G.C.B. Evans Brothers, Ltd., Montague House, Russell Square, London, W.C.1. Illustrated. Price 15s.

THE story of Guy Gibson's dam busters has been told and retold in hundreds of thousands of words since that gallant little force of 19 Lancasters took off from Scampton on 16th May, 1943, to achieve so much and to pay so high a price for its achievement. But the story has never been told like this!

Best of the earlier accounts was Gibson's own in *Enemy Coast Ahead*, which has recently been reprinted by Michael Joseph (price 7s. 6d.). But it was written while the war was still being fought, and Sir Arthur Harris suggested in his foreword that one day it might be possible to tell the other side of the story—of the scientists who made the exploit possible. Paul Brickhill has now been able to cover both aspects, and the result is so fantastic that *The Dam Busters* is as exciting as any good novel. Yet it is also factual, and written with sincerity and skill.

The story of the development of Barnes Wallis' dam-busting weapon, of the formation of No. 617 Squadron and of the raid itself fills the first 108 pages of this 268-page book. The weapon still may not be fully described, but new hints are given of its extraordinary form and the way it worked. Almost as fascinating are Mr. Brickhill's vivid pen-portraits of Wallis, Sir Arthur Harris, members of 617 Squadron and Air Chief Marshal Sir Ralph Cochrane, "the key figure behind all that 617 achieved."

There follows a record of actions fought by the squadron in the last two years of war, under the successive leadership of Cheshire, V.C., Willie Tait and Johnnie Fauquier. Few novelists would dare to test the credulity of their readers with such stories, for this was the R.A.F.'s "suicide squadron", the boys who really could put a bomb into a pickle barrel from 20,000 ft. If you doubt this, read the account on pages 168-9 of the bombing of La Ricamerie needle-roller-bearing works near Lyons. "It lay in a narrow valley with 4,000ft hills on each side, and the actual target, in the middle of a built-up area, was only 40yd by 70yd. Cochrane warned Cheshire that on no account was a single Frenchman to be hurt." After the raid "only the wall round the factory remained; the rest had disappeared and there was no damage outside."

Vital in its effect upon the accuracy of night (and, later, day) bombing, incidentally, was the development of pin-point dive-bomb marking, first with Lancasters and later with Mosquitos. First attempts and the development of this technique by Martin and Cheshire make absorbing reading.

Even more incredible than La Ricamerie was the bombing of Nienburg Bridge, near Bremen, against which Fauquier sent only 4 of the 19 aircraft in his formation, to try to save some of Wallis' precious new Tallboy and Grand Slam "earthquake" bombs. "The four Lancasters made a steady run in loose formation and bombed almost in the same second. Fauquier saw the first two bombs hit simultaneously on each end of the bridge. It lifted bodily and still intact into the air, seemed to hang there a second, and in that very moment *a third bomb hit it fair and square in the middle*."

There are dozens more equally incredible stories; of how Tait remedied the deficiency of his target markers on one occasion by circling low over a rocket site and asking his pilots to aim their bombs *at him*; of the "wonder and alarm" felt by pilots of No. 617 the first time they saw a Lancaster in flight carrying a Grand Slam, "its wings in a graceful arc, curving up at the tips as they took the strain of the 10-tonner," and of how towards the end of the war, Fauquier accepted the surrender of the German sailors whose U-boat pens his bombs had liquidated.

This is a book worthy of the story it tells, conveying to the most chairborne reader something of the suspense, fear, excitement, high spirits and heartaches of Bomber Command's war. Above all, it contains a heartening message for the present time, by showing what can be achieved by a small force provided it has the right spirit, the right sort of equipment, and the knowledge and ability to use it in the right way.

"Boxcars in the Sky," by Richard Malkin. Import Publications, Inc., 10, Bridge Street, New York 4, U.S.A. Illustrated. Price $4.75.

THIS, claims the dust cover, is "the thrilling story of flying cargo, illustrated with 140 dramatic photographs." And even if Mr. Malkin's writing style hardly bears out the first promise, at least for English readers, *Boxcars in the Sky* is still the most interesting and factually complete book on the subject of air freighting that has yet appeared.

In a chapter entitled "The Gimmick Pays Off," Mr. Malkin quotes General Harris, ex-Chief of Staff of the U.S. Air Transport Command, that: "any article which can be gotten into an airplane either complete or in sections, and which is not so heavy that an airplane cannot lift it, not only will be, but has been, carried by air under some circumstance somewhere in the world—not as a stunt, but as an economic delivery."

Mr. Malkin leaves little doubt of the truth of General Harris's remarks, and describes the transport by air of almost everything from cows to corsets, discussing the economics and advantages of air-freighting newspapers, fruit and vegetables, fish, clothes, animals, furniture, mail, flowers, machinery, drugs and hundreds of other commodities.

A chapter on the Air Baltic Exchange is followed by one entitled "Where's the helifreighter?", and others on the possibility of dropping civil freight by parachute, the importance of the right type of packaging and lessons of the Air Lift.

"The Weather," by George Kimble, F.R.G.S., F.R.Met.S. Penguin Books, Ltd., Harmondsworth, Middlesex. Illustrated. Price 3s.

WHETHER they contain fact or fiction, "Penguins" are always good value, and here we have 250 pages (making some 100,000 words), plus pictures, bibliography and index, for less than the price of 20 cigarettes. Quantity, of course, is no measure of quality, but Professor Kimble offers both. He has covered all but the most specialized aspects of meteorology, and what makes the little book so attractive is his approach: throughout, he achieves the feat (alas, so rare today) of presenting scientific facts in a "popular" style without being facetious, arch or just downright silly.

Twenty-four cloud pictures, in photogravure, are among the finest of their kind we have seen.

If the reader knows nothing about weather, perusing one chapter of Professor Kimble will make him want to know everything; and if he thinks he knows everything, reading the whole book will probably show him how wrong he is.

"With Rommel in the Desert," by Heinz W. Schmidt. George G. Harrap and Co. Ltd., 182, High Holborn, London, W.C.1. Illustrated. Price 12s. 6d.

THIS portrait of Rommel, drawn by his South-African-born *aide-de-camp*, will explode a lot of myths about "Hitler's General." "I do not subscribe to the theory that Rommel was a superman," writes Schmidt. "Close to him, I found him much more unimaginative and stolid than the romanticized pictures that have been drawn of him by both friend and foe." Nor, apparently, did the fact that he was supposed to be Hitler's favourite general help Rommel much. He seldom received promised reinforcements and supplies which would have given him a fighting chance of victory in the desert, and many of those that were sent were dealt with effectively *en route* by Allied aircraft from Malta and North Africa.

The result was apparent in the game of bluff and counter-bluff that preceded the battle of Alamein. But "where Rommel disguised ordinary vehicles as tanks to conceal his weakness, Montgomery with laths, canvas and sacking transformed formidable new American tanks into innocuous-looking transport vehicles to conceal his strength."

Heinz Schmidt pays due tribute to Rommel's ability, humanity and disregard for personal safety, but does not disguise the fact that the last nearly cost the general his life on several occasions when he was strafed by British aircraft. In this connection, it is particularly gratifying to read of the respect which the enemy retained for the Hurricane, even in 1942, and that it was not only the Allied air forces which sometimes made the mistake of bombing the wrong side!

The author is lavish in his praise for British and Dominion troops, particularly the Australians, who won a grim reputation for their terrible work with the bayonet. And he leaves no doubt of the influence of air power in the desert war. During one night in the retreat from Alamein, for example, air attack cost the Afrika Korps more men and Panzers than had some armoured engagements.

"Bridging the Pacific" (Aero Field Handbook No. 11), compiled by John C. W. Field, Francis J. Field, Ltd., Sutton Coldfield. Illustrated. Price 7s. 6d.

THOUGH basically a philatelist's guide to current values of "covers" carried on air-mail flights over the Pacific and Tasman Seas from 1919 to 1951, this 50-page booklet contains so much data that it should be of value to all who compile aeronautical history for business or pleasure. Aircraft makes and types are seldom mentioned, but are recognizable on many of the stamps.

Power-operated Flying Controls

An Essential Feature in Forthcoming Aircraft: Part I: Requirements and Basic Design-features

By R. WESTBURY

SOON after the war it became clear that there were many aircraft types forthcoming the size and/or speed of which would make some form of power operation of controls essential. Intensive work followed, and today there are two forms of servo-operated controls—the aerodynamic spring-tab type, in which power is obtained from the airflow, and the mechanical type in which power is derived electrically or hydraulically from the engine. The aerodynamic servo offers a solution attractive in its mechanical simplicity, but may have limitations making it unsuitable for universal application; furthermore, design is admittedly difficult and considerable flight development is required. On the other hand, the design of the mechanical type is also simple, while development can be performed on a test rig before the first flight of the prototype aircraft.

This review is in two parts: the first, reproduced here, deals with general operating requirements and with the types of single-unit hydraulic control. In Part II, possible causes of failure will be discussed and methods of unit-duplication described.

Mr. Westbury is a member of the technical staff of H. M. Hobson, Ltd., who are producing powered controls for a number of new aircraft types.

THE specialist hydraulic firms and certain aircraft main contractors quickly appreciated that hydraulic power, being easily controllable, was one of the most suitable media to use for the operation of powered flying controls. With the exception of the controls for two very large aircraft, the Bristol Brabazon and the Saunders-Roe Princess, development tended at first to be concentrated on powered controls which assisted the pilot and provided alternative direct manual control, either at will or in an emergency. More recently, increasing attention has been paid to fully-power-operated systems, where the pilot cannot himself provide any useful effort and where, since failure of the power unit would otherwise leave the aircraft out of control, some form of duplication is essential.

An alternative to the duplication of the servo system operating each single control surface is the splitting of the surfaces themselves into a number of sections, each section being operated by an unduplicated power unit. If there is a sufficient multiplicity of sections, individual power units may fail in a random manner without adversely affecting the safety of the aircraft, but if control surfaces are merely divided into two parts then the power unit must be arranged to revert on failure to a neutral trailing position.

There have been many diverse solutions to these latter problems and it is the main purpose of this article briefly to describe the outstanding characteristics of the various types of fully-power-operated flying control.

Operating Requirements

It will, perhaps, be as well first to deal with the requirements to be met by the powered-control designer; that these present considerable difficulty will readily be seen.

Foremost is that of safety. It is probably true to say that there is no portion of an aircraft on which the consequences of failure are more catastrophic, neither is experience of aircraft general hydraulics such as to make 100 per cent reliability a reasonably attainable objective for powered-control development. By 100 per cent reliability it is meant that the possibility of failure should be as remote as, say, structural failure of the main wing spar. As will be shown later, it is difficult to see how any lower standard than this can be tolerated. A definitely reduced degree of fallibility is called for than applies in the case of the manually operated mechanical control system. These considerations indicate that duplication of the servo unit is a minimum requirement, and that very great care must be taken to ensure that no form of failure in one half of the duplicated powered control can interfere with the normal operation of the remaining half. Whether even duplication of powered controls provides a sufficient measure of safety for civil aircraft operation is, perhaps, open to question at the present time.

Response.—Broadly speaking, good response means the ability of the powered control to interpret and translate the (human or automatic) pilot's actions into suitable control-surface movements without in any way imposing upon the pilot its own will. A number of characteristics may be said to come under the heading of response, including maximum rate of control movement, positional accuracy, phase lag and pilot's input force.

The maximum rate of control application is generally required only on landing and, usually, is associated with control hinge moments of small magnitude resulting from the low air speed. Some very high rates, of the order of 100 deg/sec or more, have been recorded with manual flying controls, but the general feeling is that these are not essential for the maintenance of full control, and that 60 deg/sec is sufficient for fighter aircraft ailerons, whilst larger types may operate at as little as 20 deg/sec. The control hinge moments are, in most cases, enormously increased under high-speed flight conditions, whilst required rates of control movement are correspondingly reduced.

Positional accuracy, i.e., accurate correlation under static conditions of control-column and control-surface angles, is in itself of comparatively little importance. The pilot regulates the stick movement by the response of the aircraft itself and so automatically compensates for this type of error in the powered control.

The phase-lag corresponds, roughly speaking, to the lag of the servo output behind input, this lag being used as a signal for regulating the output rate, e.g., by means of a control valve. The difference between input and output positions upon which all servo mechanisms depend is usually termed the error signal, and its magnitude is of great importance in relation to the stability of the system. It is not difficult to visualize, for example, the result of the control surface lagging substantially behind the pilot's movement whilst he is correcting an undesired motion of the aircraft. In the absence on the pilot's part of any anticipation of the phase lag, he will bring the control to rest when the desired effect is achieved on the aircraft; the control surface, continuing to move, will then produce an aerodynamic over-correction, compelling the pilot once again to initiate corrective action. In this way a continuous oscillation can be built up which a human pilot by anticipation and adaptability can, in actual fact, damp out. With an automatic pilot, however, no such anticipation or knowledge of the powered control's characteristics can exist and the continuous oscillation will persist.

It is the case of automatic-pilot operation which calls for the reduction of phase-lag to the absolute minimum.

Powered-control input forces are of equal importance to phase-lag especially if, as is the general case, a mechanical signalling system is used between the pilot and the powered

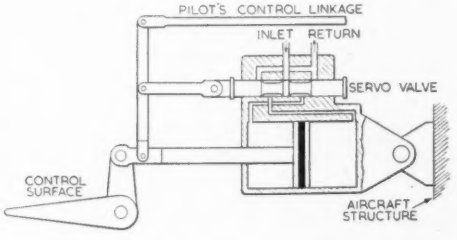
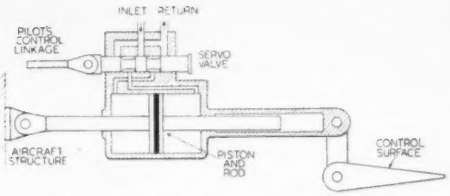


Fig. 1. Servo motor for power-operated flying control.



[Fig. 2. *Simplified arrangement of motor shown in Fig.* 1.]

control. Friction force to be overcome before the system is set in motion is approximately equivalent to manual-control-circuit friction and is no more harmful. Normally, however, a restraining force of similar magnitude will be necessary to bring the system to rest again, and this restraining force can produce overshooting and oscillation which is additive to any that may be caused by phase-lag.

Sources of Power.—Power may be transmitted from the engine to the powered control unit either hydraulically or electrically. There is no unanimity of opinion as to the best method, although there does seem to be some tendency to favour electrics for the large high-altitude aircraft and hydraulics for the smaller types.

The electrically powered system incorporates its own pump driven by an electric motor and provided with a self-contained fluid reservoir. One of the merits of this method is that, since the electric motor and pump are running continuously, the powered control unit is self-heating and is suitable for use at the lowest ambient temperatures without difficulty. On the other hand, the weight of the electric motor is considerable and it is only on the larger aircraft that the reduced weight of electric cables, as compared with hydraulic pipes, begins to mitigate the weight-penalty of additional electric motors. A further advantage is that a completely self-contained unit can be initially tested or serviced away from the aircraft, while all refilling with fluid, replacement of worn parts, or other maintenance, can be carried out under carefully controlled conditions.

Positioning the pumps on the engine, and piping the hydraulic fluid through the aircraft to the powered control, results in a comparatively simple system which, however, in some instances may involve difficulties caused by the low temperatures encountered in the wings. Transmitting substantial powers over large distances calls for the use of large-diameter pipes, owing to the viscous nature of the fluid at low temperatures. A further disadvantage is that the output of the engine-driven pump is at a minimum when the requirements for rate of control-movement are at their maximum, i.e., on landing. This may be considered a temporary difficulty in that it results only from the lack of large-capacity pumps at the present time. If a pump were designed to produce the required flow at landing (engine) r.p.m. it would produce excessive power under other flight conditions, but the penalty for this in terms of increased fuel consumption is negligible.

If required, hydraulic accumulators may be installed in order to provide a reserve store of energy to meet the large flow requirements during landing. This, however, may be undesirable owing to the danger of the accumulator(s) becoming exhausted following an unusual amount of control movement.

In the case of military aircraft the vulnerability of electric cables is generally considered to be less than that of hydraulic pipes.

Irreversibility and Rigidity.—A manual control-circuit system is reversible and is to some extent elastic. Due to these characteristics it is normally necessary for control surfaces to be mass-balanced about their hinges in order to prevent flutter. If the operating member for the control surface could be considered as a rigid structural member anchored to the wing, the control surface would, in effect, become part of the wing and the necessity for mass balance would be eliminated.

The use of powered controls without manual reversion immediately opens up the prospect of taking this step and saving a very substantial amount of weight—exceeding perhaps that of the powered control itself, which is in any case essential from the control-load viewpoint.

In actual fact, of course, the powered control cannot be considered as a rigid structural member, and great care is necessary in the selection of powered control characteristics if the mass balance is to be eliminated. The first and obvious step is to avoid the use of any form of linkage which feeds back a proportion of the control-surface load to the pilot. Such feed-back is a useful method of providing stick "feel" which is frequently adopted in the case of power-assisted flying-controls, but it will readily be seen that despite a servo which is, in itself, irreversible, any feed-back of force to the pilot can cause the overall system to be reversible *via* forces transmitted back to the stick and fed into the servo input.

In Fig. 1 is shown a simple form of servo motor suitable for development into a power-operated flying control. This unit is basically irreversible in that, even if the input connection is constrained elastically, changes in reaction load applied to the output do not produce any deflection. In actual fact, this statement is only partly true; oil, despite the common belief in its incompressibility, is actually elastic to a surprising degree even when free of aeration, whilst the presence of air bubbles (which are difficult to eliminate) considerably aggravates this condition. Whereas, owing to the resetting action of the valve, steadily applied loads can be supported without appreciable deflection, shock loads applied to the jack will cause it to behave as a rather stiff spring, with a rate of deflection-under-load determined by the compressibility of the fluid and the elasticity of the cylinder walls.

The combination of an elastic control-surface anchorage and the mass of the surface itself determines the natural frequency of oscillation of the complete system, and the basic problem is to ensure that this frequency is so far removed from that of the wing as to ensure that the two do not combine to produce flutter. In general, this implies that the control-surface frequency must be substantially higher than the wing frequency since the latter is, in any case, fairly low.

The considerations outlined above have led to the development of systems employing screw jacks driven by hydraulic motors, and to various refinements in hydraulic jack design aimed at increasing rigidity.

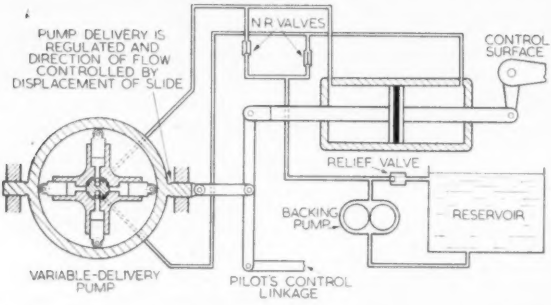
Operating Life.—Until the advent of powered flying-controls, hydraulic equipment on aircraft had been designed for duties involving, during each flight, only a few relatively infrequent movements. It is very doubtful, for instance, whether the average undercarriage jack is ever called upon to operate more than ten thousand times during the life of an aircraft. Powered flying-controls may, in rough weather, be in movement during the whole of a flight and a very large number of reversals of direction can occur during quite a short period. A considerably improved standard of mechanical design—particularly of fluid seals—is therefore required, and metallic high-pressure seals which are permitted to leak slightly but are followed by low-pressure rubber seals, the intermediate space being vented to return, are frequently employed.

Operating-temperature Range.—Most types of aircraft are now required to be capable of globe-wide operation without modification. Ambient temperatures can range from —85 deg C to +45 deg C in flight and from —40 deg C to +90 deg C on the ground, giving a total temperature range of 175 deg C. No present-day hydraulic system is capable of operation at temperatures as low as —85 deg C, owing to the increase in fluid viscosity and to the hardening of synthetic-rubber seals. Heating of the powered control by fluid circulation, or some such means, is therefore essential on high-altitude aircraft.

Types of Powered Flying Control

Hydraulic Jacks.—One form of powered control has already been shown diagramatically in Fig. 1. A somewhat simplified version is depicted in Fig. 2, where the follow-up linkage is dispensed with by anchoring the piston rod of the jack to the aircraft structure and the jack body to the control surface. As the valve guide is attached to the jack body, an automatic

POWER-OPERATED FLYING CONTROLS . . .



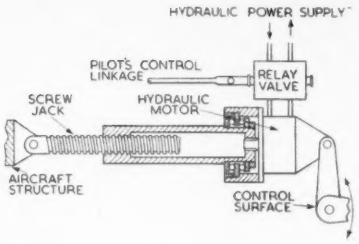


Fig. 3. (Left) Electrically driven system: method of control by variable-stroke pump.

Fig. 4. (above) Screw-jack powered control.

valve-resetting action takes place as the latter moves in response to the initial valve opening.

For electrically driven systems the valve may be discarded and control obtained by means of a variable-stroke pump, as shown in Fig. 3. Here the pump delivery is regulated from zero to a maximum in either direction by varying the eccentricity of the cam track on either side of a central neutral position. The lever operating the eccentric is linked to the jack and to the input in the same manner as the valve of Fig. 1. In order to ensure that the jack is completely filled with fluid when the pump delivery is nil, and to place this fluid under a positive pressure at all times, a further backing pump is required in order to feed fluid at a pressure of about 500 lb/sq in into the jack cylinder through non-return valves. The pressurization of the fluid reduces the volume of any air bubbles which may be present and substantially increases the rigidity of the jack.

A variable-stroke-pump type of powered control is, of course, suitable only for use in systems where the pump is directly coupled to the jack, i.e., electrically driven systems. Its use on small aircraft undoubtedly imposes some weight penalty, since the conventional engine-driven hydraulic pump with pipe-line distribution of power is lighter.

Screw Jacks.—It has already been mentioned that rigidity requirements have led to the development of screw-jacks driven by hydraulic motors. An irreversible screw-jack is comparable with a structural member from the rigidity viewpoint, and the natural frequency of a control surface operated by such means will be very high.

Fig. 4 shows a screw-jack powered control. It will be noticed that the arrangement of control valve and follow-up linkage is identical with that used for the equivalent valve-controlled type of hydraulic jack.

As with the hydraulic jack, electrically driven pumps may be close coupled to the hydraulic motor, or the variable-stroke pump may be applied as shown in Fig. 3.

In a further interesting variation, the hydraulic pump and motor form a compact unit which may be mounted in the fuselage, where temperatures are comparatively high and servicing in flight is possible, whilst rotary shafting transmits power from the hydraulic motor through the aircraft to screw jacks mounted adjacent to the control surfaces. If advantage is to be taken of the high rigidity of the screw jacks it is, of course, essential that the latter should be placed as close as possible to the control surface in order to avoid elastic effects in the intermediate linkage.

Screw-jack Efficiency.—The efficiency of a screw jack is readily controllable during the design stage by adjustment of the helix angle or the type of thrust bearing. If the efficiency from input to output is less than 50 per cent, then the efficiency of the screw operating in the reverse direction—i.e., feeding-back forces from what is normally the output to the input—will be zero, and the screw will be irreversible. For normal efficiencies in excess of 50 per cent the screw will become reversible with a reverse efficiency rising from zero to 100 per cent as the normal efficiency rises from 50 per cent to 100 per cent. Generally speaking, efficiencies in excess of 70 per cent are obtainable only by the use of the well-known recirculating-ball types of screw, with their low friction.

When a screw jack is used in a powered flying control its efficiency is of importance in connection with two apparently mutually opposed design requirements, (*i*) the necessity of maintaining irreversibility and a high degree of rigidity, and (*ii*) the need to economise in installed power. If engine-driven pumps are used as a source of power, the latter consideration is of less importance than in the electrically driven pump, where the penalty of inefficiency is not only an increase in electric-motor weight, but the need for larger pumps and hydraulic motors; in all cases, however, the efficiency of the screw influences the total weight of the installation.

Fortunately, a sufficient degree of rigidity (many times greater than in the equivalent jack designs) can be obtained when using a reversible high-efficiency screw in conjunction with a suitably geared hydraulic motor. The improvement in the case of the screw jack is due to the reduced volume of fluid subjected to compressibility. In a hydraulic jack the entire quantity of fluid required to complete a full stroke is contained within the jack and, when a load is applied, is compressed. A hydraulic motor geared to a screw jack, however, completes many revolutions during the jack stroke, but the quantity of fluid in the motor at any instant corresponds only to one revolution and the effect of fluid compressibility is proportionally reduced.

It will thus be seen that on electrically driven systems a good compromise is possible, the use of high-efficiency screw jacks resulting in a negligible loss of rigidity, although in certain instances irreversible screw jacks may with advantage be employed in conjunction with engine driven pumps.

(To be concluded)

IRAQ SURVEY CONTRACT

THE Survey Department of the Iraq Government has awarded an aerial survey contract to Hunting Aero Surveys, Ltd., for aerial photography and contour-mapping of a large part of Iraq. The contract is the first step in the economic development of the country as drawn up by the Iraq Government Development Board and from the survey will be prepared accurate maps which are to be used for many development projects in connection with road construction, planning of water supplies, land settlement and power schemes. The photographs will also be used for preparing a geological map of the area, as part of a proposed mineral survey of the country.

The aircraft—a Percival Survey Prince—and crew have already started on the photographic operations, which will take two years to complete. The expedition is in the charge of Capt. H. F. Warwick, D.F.C., and the photographic manager is Mr. J. D. L. Symington, who was a navigator in Coastal Command during the war. An aircraft engineer and two ground photographers are also accompanying the expedition, which is a self-contained unit with its own processing equipment. The company's senior ground surveyor has also arrived in Iraq to supervise the ground control for mapping. The film will be developed at the company's expedition base in Iraq, one set of photographs handed to the ground-survey staff, who will at once brief the ground control for the air mapping.

Hunting Aero Surveys, which is the parent company of a world-wide group of aerial survey companies, has been engaged on air survey in the Middle East for some 15 years.

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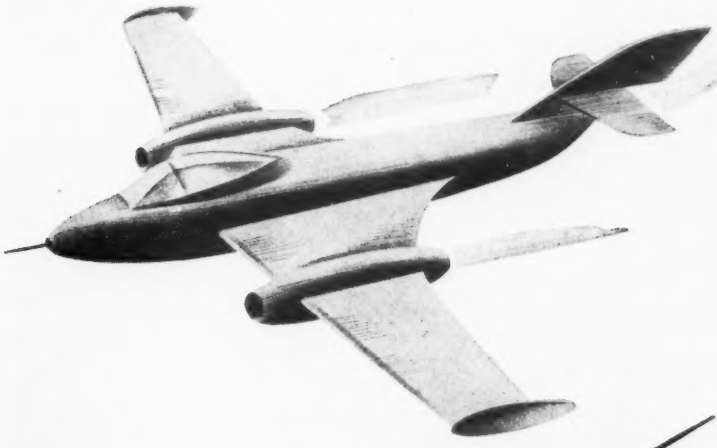
It's a fact! Ever since Cellon started making Aircraft Finishes in 1911, their policy for flight operations has been to create finishes of the highest quality. Traditions in the world of aviation may still be comparatively new, but they are held as sincerely as any which are centuries old. One such tradition is the careful testing by the aircraft industry of the products and components it employs. When so much care is devoted to the safety of the structure it is only right that the same precision should be given to ensuring its adequate protection and it is on this theme that Cellon has founded its reputation. With forty years of "Ops" behind them, the Cellon research laboratories are constantly at work devising materials to meet the demands of new aeronautical developments. Today, Cellon is recognised as the first name in flying finishes.



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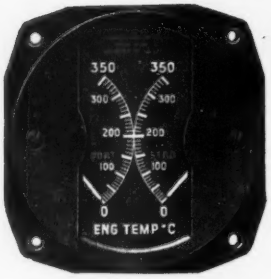

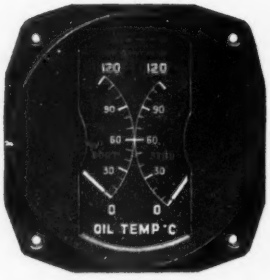

Illustrations show:

Above, Model S128. Dual Engine Temperature Indicator, comprising two Millivoltmeters of 100° scale housed in large-size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chrome/alumel thermocouples.

Below, Model S127. Dual Ratiometer Indicator, comprising two 100° Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or position.

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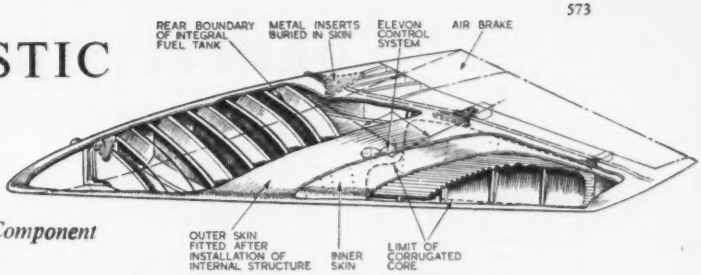
DELTA PLASTIC WING

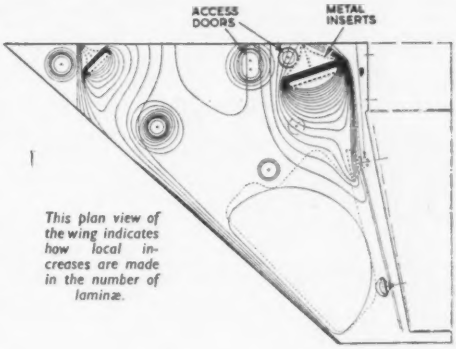
Features of an R.A.E.-developed Component


REAR BOUNDARY OF INTEGRAL FUEL TANK
METAL INSERTS BURIED IN SKIN
ELEVON CONTROL SYSTEM
AIR BRAKE
OUTER SKIN FITTED AFTER INSTALLATION OF INTERNAL STRUCTURE
INNER SKIN
LIMIT OF CORRUGATED CORE

Detail of the moulded wing, showing structural formation.

THE prototype moulded plastic wing developed at the Royal Aircraft Establishment and shown at the S.B.A.C. display this year is one of a pair designed for flight trials in "an existing aircraft." With a spanwise dimension of 8ft from tip to root, and with a root chord of 11ft, the wing is of symmetrical section and is constructed as a compound moulding of Durestos, an absestos felt impregnated with a water-soluble phenol-formaldehyde synthetic resin. The method was the subject of a paper by J. E. Gordon, Head of the Plastic Structures Section, Chemistry Department, R.A.E., at the recent Anglo-American Conference.

The wing embodies a single spar at the rear, shear being taken in the leading edge, whilst metal inserts buried in the skin laminæ take care of stress concentrations at the wing/fuselage attachment points. The trailing edge of the wing is completed with air-brake and elevon surfaces, which are of metal. Approximately one-third of the interior volume is taken up by an integral fuel tank in the forward "corner", the tank being spanned by a series of stabilizing membranes with Y-flanged-webs to the upper and lower skin surfaces. Outboard of the tank is a series of channel ribs running normal to the leading edge and back to the main spar. Over these "basic" structural members is fitted a corrugated core and an inner skin strengthened by local increases in the number of laminæ in regions of stress concentration and cut-outs for access doors. The whole finally finished with a "split-skin" giving a high-quality surface finish. The manufacturing technique is fully described in the November issue of our associated journal, *Aircraft Production*.



This plan view of the wing indicates how local increases are made in the number of laminæ.

ON STABILITY AND CONTROL

THE 14th Wright Brothers' Lecture was delivered before the Institute of the Aeronautical Sciences in Washington, D.C., by Dr. William Bollay under the title *Aerodynamic Stability and Automatic Control*. The full text, which is only now available, is published in the September issue of the *Journal of the Aeronautical Sciences*.

A masterly exposition, the lecture summarizes the more recent developments in the field of aerodynamic stability and automatic control, with particular reference to the analytical and experimental methods used today in the design of aircraft control systems. The paper indicates that the analytical methods for studying automatic control systems are essentially those presented by Routh in 1877, and that the principal new step has been the reduction of these analytical methods to graphical techniques, the most useful of which are the "root-locus" methods of Evans, the amplitude and phase plots of Bode, and the vector response plots of Nyquist. The general methods of design, including the use of analogue computers (simulators) and the analysis of flight-test data, are discussed, as are some of the future potentialities of automatic controls in application to aircraft.

The paper concludes with the observation that, whilst the past 25 years have brought revolutionary developments in aerodynamics and aircraft propulsion, the next 25 years will see comparably important advances in aerodynamics by the application of automatic controls, culminating not only in guided missiles, but also in transport aircraft that will be automatically controlled from take-off to landing.

A CRANFIELD APPOINTMENT

THE Board of Governors of the College of Aeronautics have appointed Professor W. S. Hemp, M.A., A.F.R.Ae.S., to succeed Professor R. L. Lickley, B.Sc., D.I.C., M.I.Mech.E., F.R.Ae.S., as Head of the Department of Aircraft Design. Professor Hemp will retain his present title of Professor of Aircraft Structures and Aero-Elasticity, and the appointment will take effect from November 1st.

Professor Hemp was a Scholar of Jesus College, Cambridge, from 1934 to 1937, where he read mathematics. He joined the Bristol Aeroplane Co. in 1938, where he was engaged on design and research work and was in charge of the project stress office during the early stages of the development of the Brabazon. He was appointed to the staff of the College in September 1946 as a Senior Lecturer in Aircraft Structures and in August 1950 was appointed Professor of Aircraft Structures and Aero-Elasticity within the Department of Aircraft Design.

Professor Hemp is the author of many research reports and of a monograph on stressed-skin construction. He is a member of the Structure and Oscillation Sub-Committees of the Aeronautical Research Council and is a consultant to Saunders-Roe Ltd.

TRIBUTE TO TECHNICAL PRESS

"WE must profit from the experience of others; we must be kept informed of fresh developments, new machinery and equipment; we must have expert advice on specific problems; we must have a forum in which to air our views and ventilate our grievances. Where else can we find all these things but in the pages of the trade and technical Press?"

This tribute to technical journalism was paid by Mr. H. V. Schofield, M.C., M.I.E.E., sales director of Chloride Batteries, Ltd., in a speech at the company's annual luncheon held in connection with the Motor Show.

Speaking of progress made in the production of Exide batteries during the past year, Mr. Schofield mentioned the current world shortage of lead, and said that in their case the difficulty had to some extent been solved by the adoption of the "microporous" plastic separator, which enabled the lead in cells to be put to the most efficient use.

Another speaker at the same luncheon, incidentally, was Mr. Kenneth Horne, of "Much Binding" fame, who was there in his more serious capacity as a director of the Triplex Safety Glass Co., Ltd. That status, however, did not preclude him from making one of the most entertaining speeches we have heard for many a day. Taking an Exide battery-service manual, he proceeded to read extracts from it which showed the instructions in a light which the compilers most certainly never imagined. He finished on a sentence from the guarantee: "The introduction of any impurity renders this agreement invalid." "That," he remarked, "reads just like a B.B.C. contract."

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Visibility and Safety

THE Monckton Report [summarized in *Flight* of October 19th] on the B.E.A. Viking crash at London Airport last October advocates minima of visibility which must be observed by pilots when landing, but adds that the pilot shall be governed by a lower minimum than that prevailing on the ground. The latter surely does not take into account, however, that minimum visibility on the ground is often better than that in the air. For example, in conditions of lifted fog or haze, horizontal visibility under the fog has no bearing on horizontal visibility through the fog or haze —which in turn bears no relationship to downward or upward visibility. (This, in such circumstances, can often be quite clear.)

E. Twickenham, Middlesex. D. HORNSEY.

On Tow

CAN anyone throw some light on the following? During the early part of the war (1941-42) I saw a Wellington towing a Hurricane, the airscrew of which was idly ticking over. The machine came from the direction of Boscombe Down. Was this an attempt at long-range escort fighters, for it must be remembered that this class of aircraft was still novel in 1942? Long-range drop tanks were unheard of then—or am I wrong in saying so?

Andover, Hants. DONALD SUTTON.

[Experiments were made with towed Hurricanes in order to extend their endurance for convoy protection. Long-range tanks were not entirely "unheard of" all the time, though Britain was late in adopting them.—ED.]

Facing Which Way?

I DO not wish to be tiresome and I hope I am not repetitious about this matter of seating, but I think it is important and, after reading Mr. Hornsey's interesting letter, I think there is still something useful to be said. It is true that on balance I am in favour of rear-facing seats, provided they will not part from the floor on impact, but that is a hypothesis and not a conclusion. It is no use our holding firm views on the subject unless those views are soundly based and can be translated into practical action on the part of the operators, with a consequent saving of lives. Clearly, the operators are not convinced to the point of action by whatever arguments have been put to them, and I was prompted to write in the first place by the fact that most of the "arguments" and "evidence" which I have come across, in quite well-informed quarters in several countries, seem to me to be no more than prejudices or conclusions too quickly drawn from insufficient evidence.

In order to convince the men who have to risk their own or the public money there must be at least a formally complete theory of what will happen to passengers facing backwards as compared with those facing forward, and this theory must be supported by a considerable body of empirical evidence. This is the first step, and it is by no means completed; in fact, many people closely connected with the problem do not yet seem to have formulated it clearly.

In attempting a formally complete description of comparative results of accidents involving the two kinds of seats I missed some points and I gladly accept Mr. Hornsey's amendments on the possible advantages of rear-facing seats in ground loops, etc., but only if they do not break away from the floor. The case of the Hastings which he mentions was not known to me, and it provides valuable empirical confirmation of the theoretical argument, but it cannot be regarded as convincing since it is a particular case and no generalizations can legitimately be made from it either for or against the hypothesis that rear-facing seats may save lives.

Incidentally, I do not think his statement of the value of these seats in disintegration of the fuselage will do. If they part from the floor the effect is likely to be sandwiching or rapid projection of the seats in various directions. In the first case it will make little difference which way one is facing; in the second, the infinite number of possible directions of impact nullify the value of any previous siting of seats.

There thus seem to be at least two questions which have to be answered. First, can seats be anchored so as not to break away under the "g" imposed by an aircraft striking the ground horizontally at any speed up to its maximum and still remain an economical proposition? Secondly, if they can, how are we to get the empirical evidence needed to show that they do, in fact, save lives? I suggest that the first question is quite fundamental and is not answered by Mr. Hornsey, although he quotes two opinions using the figures of 12g and 14g. A contemporary of *Flight* recently mentioned the figure of 20g. This is an advance on some of the hopeful but unsupported ideas that I have come across, but what is the right figure, and can it be done? I don't know. Does anyone? If not, how can we come to a conclusion at this stage? Furthermore, what sort of aircraft are we talking about? Clearly, the problem must be approached on much narrower lines than is usual. It will not do to dismiss the matter in a paragraph, citing one or even several accidents as if they were overwhelming evidence.

The second question cannot be answered conclusively until we have some more accidents involving rear-facing seats. This will seem very hard-bitten to some, but is there any other way? No one will accept the argument for rear-facing seats as proven until there exist statistical norms which can be compared with those of the known casualties with forward-facing seats. Thus we are faced with the dilemma that we are unable to prove conclusively a theoretical argument because we cannot get the evidence we need until the theoretical argument has been proved. A silly position.

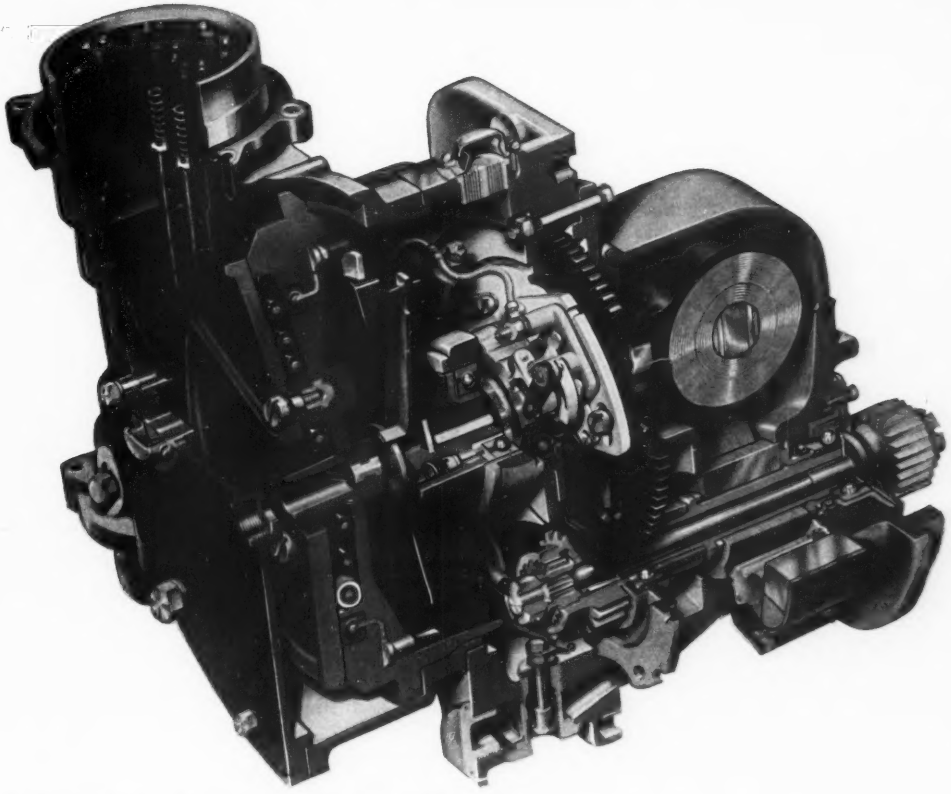
Since there are going to be more accidents and since we need evidence on the value of fixed rear-facing seats (and a *prima facie* case has been established for them), I would like to see someone fit them so as both to give passengers what appears to be increased protection and to provide the evidence to prove or disprove the case. Given the engineering solution, this is where the duplicate economic problem arises, and it is at this point that I think humanitarian considerations should be given full weight. Whatever the structural costs and whatever one's views on passenger psychology it seems clear that few of those who have to risk money are prepared to risk it without conclusive evidence. However, in the case of our nationalized airlines we have corporations the justification of whose existence is that they will serve the public interest better than free enterprise, and whose results are explicitly not to be judged solely by profit and loss. It would, therefore, seem that they might well be expected to accept whatever risks there may be in fitting these seats, and they are doing so in a small way. We also have the example of the R.A.F. transports and soon, of the R.A.A.F. In time, we shall see how some more of these seats stand up to the ultimate test.

The question, then, is : How much of this evidence is enough? I don't know; but I do know that what exists is insufficient to meet either accepted statistical standards or the pragmatic standards of airline operators. The answer is probably an empirical psychological one about the length of time it takes all, or nearly all, transport operators to persuade themselves that it is in their best interests to adopt or reject completely the idea of fitting fixed rear-facing seats. In this respect public opinion may become sufficiently strong to force the issue before then. However, this is pure speculation and can wait until the immediate practical problems have been solved. When that has been done is the proper time to press vehemently for the general adoption of this safety measure.

Magdalen College, Oxford. B. J. L. HAIMES.

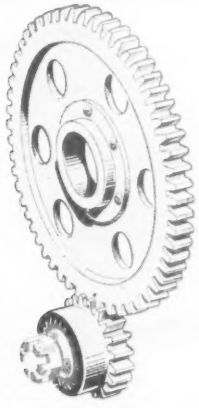
FORTHCOMING EVENTS

Oct.	30.	Society of Instrument Technology: "Materials for Instrument Manufacture," by E. B. Moss.
Oct.	30.	R.Ae.S. Section Lecture: "Supersonic Propellers," by Dr. W. F. Hilton, A.F.R.Ae.S.
Oct.	31.	Royal Air Force College, Cranwell: Boxing v. Oxford University (away).
Nov.	1.	R.Ae.S.: "Hydrodynamic Development" Films (Ernest G. Stout).
Nov.	3.	Royal Air Force College, Cranwell: Fencing v. Cambridge University (home).
Nov.	6.	R.Ae.S. Graduates and Students Lecture: "Production Research," by L. E. Bunnett.
Nov.	14.	Royal Air Force College, Cranwell: Rugby v. R.A.F. XV (home).
Nov.	22.	R.Ae.S.: "Problems of Transonic Flight," by A. M. Clifton, B.Sc., F.R.Ae.S. (at Cheltenham).
Nov.	23.	Helicopter Association: "The Giant Helicopter," by O. L. L. Fitzwilliams, B.A.
Nov.	24.	Society of Licensed Aircraft Engineers: Main Lecture: "Functioning of a Manufacturer's Servicing School," by D. W. Richardson, M.B.E., A.F.R.Ae.S.
Nov.	24.	Royal Air Force College, Cranwell: Rugby and Squash v. R.N.C. Greenwich (away); Soccer and Rifle Shooting v. R.M.A. Sandhurst (away); Old Cranwellians Dinner (London).
Nov.	27.	R.Ae.S. Section Lecture: "Aircraft Simplification v. Efficiency," by W. S. Farren, C.B., M.B.E., M.A., F.R.S., M.I.Mech.E., F.R.Ae.S.
Nov.	27.	Society of Instrument Technology: "Visual Presentation," by K. F. H. Murrell, M.A., F.R.P.S.
Nov.	29.	R.Ae.S.: "Structional Problems in Advanced Aircraft," by H. H. Gardner, B.Sc., F.R.Ae.S.
Dec.	1.	Pathfinder Club Annual Ball. Dorchester Hotel, London.



ROTAX N.14.B. MAGNETO

with ★Vernier Coupling between Engine Drive and ★High Speed Gear



Accurate timing of the magneto and engine is simplified by the Vernier coupling shown below in red.

The N.14.B. Magneto, which combines longer operating life with reduced maintenance, ease of installation and decreased "overhang" weight, was developed by Rotax specifically for the Bristol Hercules power unit of the Hermes 4.

Most British aircraft rely on Rotax.

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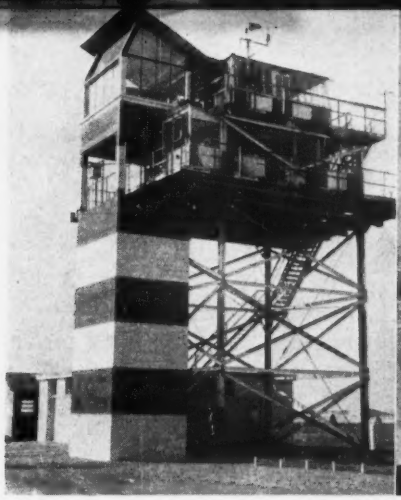

FIRST IN EUROPE: A substantial improvement in G.C.A. facilities at the French international airport of Orly is expected to result from the recent installation of Gilfillan Moving Target Indicator equipment. Radar operators are now housed in a new annexe of the control tower (extreme left) and the man-power problem has been alleviated by the fact that both scopes can now be handled by a single operator. In the right-hand photograph is seen the newly erected scanner. Surveillance radar gives effective coverage for up to 60 miles from the airport. "Flight" photographs

CIVIL AVIATION

C.P.A.'s PLANS FOR THE COMET

AS mentioned briefly in *Flight* last week, the Comets now being built for Canadian Pacific Air Lines are likely to be seen first on the South Pacific sections of the company's network, rather than on the northern arc to Tokyo and Hong Kong, as was previously contemplated. Delivery is expected late next year, by which time C.P.A. will stand to benefit considerably from the experience which B.O.A.C. should have accumulated on the type.

The Vancouver-Australia over-ocean service has particular need of Comet speed, because the stages are at present long and boring; and it suits jet-aircraft characteristics in that there are no calls for the substantial fuel reserves associated with bad-weather diversion and stacking. The weather is normally reliable in this part of the world and, although the temperatures are tropical at some of the stopping points, the runways are of adequate length for take-off.

The existing stage-lengths are specially suitable for the Comet Series I (Ghost engines), except for the Honolulu-Vancouver stage of 2,800 statute miles. This would call for the range of the Series II, powered by Rolls-Royce Avons. The intention, therefore, is to introduce the Series I Comets on the sections south of Honolulu, in conjunction with Douglas DC-6bs (Pratt and Whitney R-800 engines) on the Honolulu-Vancouver leg.

The Series I aircraft will be based in Sydney. They will work two return trips weekly, one from Sydney *via* Fiji and Canton to Honolulu (5,200 statute miles), and another from Sydney *via* Auckland, Fiji and Canton to Honolulu (5,600 miles). Australia will thus enjoy two, and New Zealand one, weekly fast services to Hawaii, with all the refinements of smooth, vibration-free travel which are the main attractions of the jet airliner. From Honolulu to the Canadian coast passengers must, for the time being, make the long stage at a more ordinary speed and height.

The actual stage-lengths for the Comet sections in statute miles are approximately as follows: Sydney-Fiji, 2,000; Fiji-Canton, 1,270; Canton-Honolulu, 1,900; Sydney-Auckland, 1,350; Auckland-Fiji, 1,320.

An agreeable facility for the C.P.A. trans-Pacific traveller will be the 30-hour stop-over at Honolulu which is permitted by the ticket. Certainly the prospect of spending a short time at Waikiki rather than of drumming through the weather layers over the vast ocean without a break seems likely to attract many passengers.

MORE AIRCRAFT FOR CHARTER

FOLLOWING the completion of the air evacuation of Abadan there has been some slight improvement in the general situation on the charter market. The evacuation had the effect of releasing the Halifax aircraft which for the past three months had been virtually grounded through lack of crews. They will now be manned by crews who have been engaged in operating Yorks for the R.A.F. in North Africa and the Middle East. These machines are not immediately available, but are gradually returning to this country and, after overhauls, and Cs. of A. where necessary, will be put on the market again. Apart from the R.A.F. contract, other Yorks have also become available on completion of their contracts to fly pilgrims to Mecca from various parts of the Middle East. The situation with regard to lighter machines, however, has shown no signs of improvement. Medium transport aircraft are scarce because of the widespread selling of Dakotas during the past few months for prices of up to £25,000. The few remaining DC-3s are heavily committed and Vikings are even more difficult to obtain, because of long-term commitments on trooping contracts.

It is also difficult to find foreign aircraft available for charter, as all scheduled lines have far more traffic than they can cope with and, in most cases, are operating with almost 100 per cent utilization on the regular routes. Although there are some signs of improvement in the availability of aircraft, the situation is still far from stable. With the possibility of further political difficulties in Egypt and Iraq, operators are wondering whether there may be another spate of Government charters for the carriage of civilians, troops or supplies. No definite moves have yet been made in this direction but—probably judging from past experience—operators now seem unwilling to undertake any long-term contracts or to make quotations for flights more than a few days ahead.

Among the more unusual of recent fixtures were two Bristol Freighter loads of horses from Lympne to Le Touquet and from Copenhagen to Cambridge, and a Dakota load of 2,000 kg of beer-bottle corks from Paris to Lagos. Enquiries have also been circulated for the transport of 1,000 live minks in cages from Milwaukee to Oslo in December, and for 12 tons of yeast from Amsterdam to Lydda immediately. There are also numerous enquiries for Continental tourist traffic and from prospective visitors to next year's Olympic Games.

THE RINGWAY DAKOTA ACCIDENT

THE M.C.A. has now published its report on the accident to Dakota G-AJVZ, operated by Air Transport (Charter) (C.I.), Ltd., which crashed at Ringway Airport (Manchester) on March 27th last. The aircraft was operating a night newspaper service from Ringway to Nutts Corner, Belfast. Following an erratic take-off in falling snow, says the report, it swung to port and failed to gain height. One or both of the engines were heard to cut before it struck a tree half a mile from the end of the runway and was wrecked; both pilots lost their lives.

The M.C.A.'s Chief Inspector of Accidents, A/Cdre. Vernon Brown, considers that the crash was due to the inability of the aircraft to gain height because of a loss of power attributed to ice formation in the carburettor intakes. Had the captain not failed to make use of the heating controls, says the Chief Inspector, the accident might not have occurred. An extended undercarriage and the presence of snow on the wings are also thought to have been contributory factors. Weather conditions at the time were said to have been ideal for the formation of ice and the blockage of the carburettors by snow freezing on the intake screens. There was no evidence of pre-crash mechanical failure, and the Dakota's all-up weight was less than the maximum permitted.

Since the accident, incidentally, the M.C.A. has issued *Information Circular No.* 132/1951 warning pilots of the adverse effects of frost, ice and snow on take-off performance. It points out that thrust, lift and drag characteristics may be impaired, with a consequent increase in the stalling speed and in the take-off distance; a decrease in the subsequent rate of climb may also follow. A number of methods of protection are specified, including the provision of covers for aircraft parked in the open and the

PRODUCTION IN PROGRESS: This first photograph of Lockheed Super Constellations in quantity production shows five machines to be already in an advanced stage of assembly. Eighty-six have been ordered and the first of them will go to Eastern Air Lines.

CIVIL AVIATION . . .

passing of icing warnings by meteorological officers to airport managers for distribution to the operators concerned. The importance of using de-icing fluid on all surfaces (including airscrew blades) before take-off is also stressed. In this connection, particular care is necessary because pilot control may be seriously affected by any residual irregularity on partially cleared surfaces or by any lack of symmetry if some parts of the aircraft are thoroughly cleared and others are not.

REVISED U.K. MAIL RATES

ALTHOUGH no official confirmation was forthcoming at the time of going to press, it is believed that B.O.A.C. has successfully negotiated an increase in the rate of payment for the carriage of first-class mails originating in the United Kingdom. The new rate, however, is thought to be still considerably below the full international scale, augmentation to which would mean an increase of 111.5d per ton-mile. The British Post Office has been paying the Corporation at an average rate of 3.27 gold francs (approximately 133.5d per ton-mile) or just over half the full international rate. The increase upon which the Post Office is now believed to have agreed is of an order that should add a little over £1,000,000 to the Corporation's annual revenue.

Payments for the carriage of mail of foreign origin are normally fixed by international agreement; the accepted rate for long-distance operations stands at present at a figure of 6 gold francs per ton-kilometre, equivalent to 245d per ton-mile. Individual countries, however, pay their own airlines at rates fixed by each national postal authority. In the Corporation's last annual report it was stated that, with few exceptions, B.O.A.C. received a lower rate from the G.P.O. than that paid to other international airlines. With few exceptions, also, other countries paid more for airmail postage than did the British commercial user. The report also stated that, if the present anomalies were removed, the Corporation's need for an Exchequer grant could be brought to so low a figure that it would provide an immense stimulus to all B.O.A.C. personnel to attempt to eliminate the deficit altogether. In the financial year ended March 31st last, revenue from mail of both foreign and U.K. origin amounted to about £6,200,000, or approximately a quarter of B.O.A.C.'s total revenue.

I.C.A.O.'s PROGRESS IN ECONOMICS

IN a speech made before the I.C.A.O. Air Transport Committee, of which he was recently elected chairman, Sir Frederick Tymms, K.C.I.E., M.C., F.R.Ae.S., United Kingdom representative to the I.C.A.O. Council, described the growing importance of some of the work carried out by the organization towards the resolution of the economic problems of international air transport. There had previously been a feeling, he said, that this progress had not been comparable with that achieved in the technical field. This was now becoming untrue. The four resolutions on multiple and burdensome taxation which had just been adopted by the I.C.A.O. Council were of very great importance. Sir Frederick thought that the lack of progress in the Air Transport Committee was not entirely due to the fact that the problems which it had to face were those in which conflicting national interests were the main factors. It seemed, he continued, that the key to the solution of many of the disputes was far less a matter of resolving national difficulties than of applying clear and concentrated thought to the facts.

Sir Frederick Tymms.

There was, however, one outstanding problem of which this was not true. The conception of a multilateral agreement on commercial rights in international air transport had failed by reason of the conflict of interests between major operators and the countries who sought to protect their own embryonic air transport industries. Sir Frederick was of the opinion that until a way could be found to satisfy or reconcile these two conflicting interests there would be little point in calling another international conference on the subject.

He listed the major items of urgent work for the coming session of the Air Transport Committee as being: (i) an analysis of the rights conferred by Article 5 of the Convention and the definition of "scheduled international air services"; (ii) the problem of charges for air transport and air navigation services [this is one of I.C.A.O.'s greatest headaches and is a question which has recently acquired a new urgency in the light of the large-scale traffic expansion that is expected to follow the introduction of tourist-class travel]; (iii) the economic problems involved in the draft *Convention on Damage Caused by Foreign Aircraft to Third Parties on the Surface*.

Sir Frederick reviewed also the major items of work accomplished by the Air Transport Committee in the past year. The international airmail study was completed and an I.C.A.O. memorandum on the subject was forwarded to the Universal Postal Union last December. On the same date the Council also adopted the Committee's resolution designed to eliminate multiple insurance and to mitigate some of the burdensome effects of national insurance requirements. On the subject of taxation the Council's last action was on October 4th last, when it established resolutions dealing with taxes on fuel, lubricants, consumable stores, income, property and sales of air transportation. On June 1st the Committee adopted a resolution aimed at simplifying procedures governing the registration of aircraft delivered by air. During the greater part of the year, however, its members had been mainly concerned with the subject of scheduled and non-scheduled air services. Complementing the work of the Committee, the Secretariat had been responsible for the publication during the year of 11 statistical summaries, covering traffic statistics, origin and destination of passengers, traffic flow, taxes and subsidies, fleets and personnel. The Secretariat had also collaborated with the World Health Organization in the preparation of international sanitary regulations.

PAN AMERICAN'S "TOURIST" INTENTIONS

TODAY, November 2nd, the American Civil Aeronautics Board is due to meet in an attempt to eliminate the deadlock between the North Atlantic airline operators on the question of low-cost tourist services. It will be recalled that last September an I.A.T.A. sub-committee, set up to work out details of a second-class-service fare-structure, broke down following disagreement. The leading protagonists of tourist-class travel have undoubtedly been P.A.A., who are so keen to offer cheap travel to the masses that they have even announced their intention of seeking approval for such services outside the framework of I.A.T.A. Later this month a further meeting of I.A.T.A. is scheduled to discuss the problem and this will in fact provide one of the last opportunities to obtain inter-line agreement before April 1st, 1952, when all North Atlantic fare agreements expire and on which date P.A.A. would, if necessary, be able to inaugurate tourist-class Atlantic travel independently.

Of particular interest is the economic basis on which the company hopes to run the service. Across the Atlantic, Pan-American proposes to use either 82-passenger DC-6Bs or 55-passenger DC-4s. The flight schedule will be approximately 13 hr between

New York and London for the DC-6Bs, and the price would be $405 for the round trip. The economic philosophy of this involves the application of the typically American maxim of lowering the unit price in order to achieve greater volume and a greater market. With 55-passenger DC-4s the break-even load-factor for the $405 round-trip fare would be 60 per cent, or 33 passengers; with 82-passenger DC-6Bs the break-even point is 49 passengers.

I.A.T.A.'s own cost committee proposed a round-trip rate of $450, based on a 65 per cent average load-factor, allowing 17 per cent of the revenue for profit plus an additional 5 per cent "protection" against inflation, but with no reduction in overheads due to the increased volume of traffic. P.A.A., however, is apparently convinced that tourist-class services will always achieve at least 10 per cent better load-factors than their first-class counterparts and is therefore willing to gamble on the $405 fare.

Incidentally, the company estimates that, with the $405 round trip, a 17-day European all-expense holiday "package" could be sold for less than $700. This, the company thinks, would more than triple the existing American market for European travel. These passengers would be mainly persons with short annual holidays who have not the time for sea travel; this class is said to represent 80 per cent of all wage-earners.

BREVITIES

THE fifth meeting of the South Pacific Air Transport Council was due to open in Wellington, N.Z., on October 29th. Australia, New Zealand, Canada, U.K., Fiji and the Western Pacific High Commission are represented on the Council, which is discussing questions of operational and financial importance to civil aviation in the South Pacific area.

* * *

In the first half of 1951, Indian airlines flew a total of 9,381,946 miles on scheduled services and carried 229,326 passengers and 16,200 tons of freight.

* * *

On October 1st Central African Airways introduced their first Beaver service, between Lusaka and Broken Hill. This schedule may be regarded as the first step in bringing Beavers into regular service on internal routes in Northern Rhodesia.

* * *

For the first time, K.L.M. is operating Convairliner services between Prestwick and Amsterdam this winter. Flights are made each Saturday and are in addition to the seven transatlantic schedules which, flying in each direction, call at Prestwick every week.

* * *

Law graduates from several of the world's most famous universities have assembled at McGill University (Montreal) with the object of preparing, in their respective languages, books on international air law. Among the graduates are representatives from Egypt, Greece, Czechoslovakia, Hungary, Rumania, U.K., Germany, Turkey and Canada.

* * *

Operations by B.O.A.C. during the first five months of the current financial year (April to August) have resulted in an "invisible" export surplus of £2,095,000 (a figure which is 48 per cent more than that of the corresponding period of the previous year). Operations in the "dollar area" alone produced a surplus of £895,000 out of the above-mentioned total.

* * * *

Prestwick Airport's consultative committee has been informed by the Minister of Transport that the plan to divert the main Glasgow-Ayr road, necessitated by the extension of the airport runways, has been approved. The Ministry had considered also the committee's alternative plan of tunnelling beneath the new runway : this would have cost £1,000,000.

SIGNED AND SETTLED: The Hon. H. L. Anthony, Australian Minister for Civil Aviation (right) signs the recently concluded Australia-Netherlands Air Transport Agreement in Canberra. With him is Jonkeer P. De Teixeira De Mattos, the Netherlands Ambassador to Australia.

One of New Zealand's best-known commercial pilots, Mr. S. Blackmore, is retiring from flying after having logged over 10,000 hr during which period he claims to have relied solely on road maps for navigation. He was well known for the innumerable "mercy" missions which he carried out; these often entailed landing for the first time on short stretches of beach or in rough fields.

* * *

The winter schedules of the Belgian Airline, Sabena, which were introduced on October 1st, show only minor changes. The frequencies of services to the Belgian Congo remain the same, although departure days have been changed in some instances. On the transatlantic route between Brussels and New York three weekly flights are to be operated with DC-6s. Between London and Brussels there will still be four daily services; the latter city will also be linked three times weekly with Manchester.

* * *

Pan American World Airways has been chosen as the official carrier for the teams which will represent the United States at the 1952 Olympic Games, to be held at Oslo (Norway) and Helsinki (Finland). Arrangements have been completed for the transport of approximately 100 American contestants and officials to the Winter Games at Oslo in February, and some 425 athletes and officials to the Olympiad Games at Helsinki in July.

* * *

Dr. Victor Gruberg-Gore, the head of Israel's Civil Aviation Department, is shortly to visit Elmdon Airport, Birmingham, with the object of studying the operational techniques in use there. He has chosen Elmdon because it is similar in size to several of Israel's own terminals. Dr. Gruberg-Gore is also seeking to recruit ground staff and pilots for his country's two nationalized airlines. In view of the recent expansion of air traffic in Israel he is hoping also to negotiate the purchase of additional aircraft.

* * *

It has been reported that B.O.A.C. is considering the disposal of several of its Hermes IVs to a private operator. There is no official confirmation of this, nor has the company with whom negotiations are being conducted been named, but it is believed that the machines sold would probably be used on trooping operations for the R.A.F. Twenty-five Hermes were ordered by B.O.A.C. and the first of them was delivered in March, 1950.

* * *

Travel from London to Sydney (Australia) in less than three days and to Tokyo in less than two and a half days is scheduled in new services to be started by K.L.M. in December. Constellations will fly along existing routes as far as Bangkok, thence on new sections to Sydney *via* Manila and Biak (New Guinea) and to Tokyo *via* Manila. Passengers making a connection from London at Amsterdam will be able to leave London Airport at 2.30 p.m. and reach Sydney 70½ hr later. This will be the fastest air schedule to Australia yet introduced.

* * *

The long association of Dr. A. P. Thurston, M.B.E., D.Sc., F.R.Ae.S., with aviation—he was chief assistant to Sir Hiram Maxim in 1902—is well known. More recently he has been active in the model-flying world. In celebration of his 70th birthday on October 31st he planned to fly round the countryside and the South Coast with his nephew as co-pilot in an Autocrat. Last Sunday he made a similar preparatory flight with Mr. Herriz Smith from Elstree. A small private birthday party (including a cake with 70 candles) was held at Londonderry House.

* * *

B.O.A.C. has now assumed the controlling interest in Gulf Aviation, Ltd., a charter company based at Bahrein (Persian Gulf) which, during the past three years, has operated scheduled services on the routes between Bahrein, Dhoha, Sharjah and Dharhan. The aircraft used for these operations include Ansons, a Dove and a D.H.86. The company will continue to operate inde-

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pendently as a joint enterprise sponsored by B.O.A.C. and local interests. It is intended to integrate Gulf Aviation's services with those of other companies in the area in order to provide a comprehensive network of air routes.

* * *

A new version of the French S.O.30 Bretagne, powered by two Pratt and Whitney 2,400 h.p. CA-18 engines, has successfully completed a 150-hr endurance test at Bretigny. The first version of the S.O.30, powered by two 2,000 h.p. Pratt and Whitney B.43 engines, was granted its C. of A. in September, 1950. Several machines of this type are now in regular service with commercial operators. A "coach" version of the Bretagne, accommodating 43 passengers, was recently delivered to Air Algérie.

* * *

B.E.A.'s travelling exhibition is to pay visits to various schools in the London Area during the next few months. During its visit to Mill Hill School, from October 31st to November 2nd, Mr. Peter Masefield, Chief Executive of B.E.A., will lecture to the boys on civil aviation; at other schools lectures will also be given. This exhibition, designed to portray graphically B.E.A.'s activities, includes maps, photographs, model aircraft, and a reproduction of a runway as the approaching pilot sees it.

* * *

A new link between Scandinavia and Chile was inaugurated on October 23rd when S.A.S. extended one of its twice-weekly Stockholm-Buenos Aires services to Santiago; the elapsed time for the route is 48 hr 15 min. Earlier this year the same company carried out familiarization flights for a non-stop service between Rio de Janeiro and Santiago. S.A.S., incidentally, is now offering what is probably the world's cheapest air ticket. It costs only 1.3 D. Kr. (approximately 20 cents or 1s 6d) and is the rate charged for children under two years of age flying on the Copenhagen-Malmo route. Following a recent 50 per cent reduction, return tickets for adults on this service now cost only 24 D.Kr. (about £1 6s).

H. B. Porteous, of Vancouver, and formerly of Montreal, has been elected treasurer of Canadian Pacific Air Lines. Mr. Porteous served as special representative to the company's president in Montreal prior to the headquarters move to Vancouver in 1949; he has been with C.P.A. since 1923.

* * *

On October 18th an aircraft owned by Queen Charlotte Airlines, who operate on the coast of British Colombia, flew into the side of Mount Benson, near Nanaimo; 20 passengers and the crew of three lost their lives. The aircraft is reported as being an amphibian, and was, therefore, presumably the company's Canso.

* * *

With a total of 58 services scheduled weekly to 14 Continental cities, B.E.A. now claims to have the largest freight network in Europe. The Corporation is carrying freight at a rate which exceeds 10,000,000 kg a year. The types of cargo seen recently in B.E.A.'s Dakota freighters have varied between goldfish from Bologna, firebricks from Paris and chicken feathers from Berlin.

* * *

Expansion of Trans World Airlines' organization in London has necessitated transfer of their executive offices, including the public relations department, from London Airport to Eagle House, 109 Jermyn Street, S.W.1. Mail, however, should continue to be sent to 200 Piccadilly, W.1.

* * *

In answer to a question which was put to him recently as to whether the runway system at London Airport would be extended north of the Bath Road, Mr. Frank Beswick, Parliamentary Secretary to the M.C.A., said that this would depend entirely on the increase of traffic and on whether the present rate of aircraft movements could be speeded up by the introduction of improved control techniques. Nevertheless, he warned a number of residents of Sipson and Harmondsworth (Middlesex), who are faced with the prospect of having their homes swallowed up by this projected expansion, that the M.C.A. had been advised that by 1953 the volume of traffic would probably have increased to such an extent that a third runway would have to be constructed north of the Bath Road.

AVIATORS' CERTIFICATES

WE publish this week another of the periodical lists of those who have qualified for R.Ae.C. Aviators' Certificates, covering the period from August 16th to September 15th. The previous list (July 26th to August 16th) appeared in *Flight* of October 5th last.

No.	Name	Club or School	Date
27,470	B. McConville	Qualified Service pilot	16.8.51
27,471	J. Higham	Qualified Service pilot	20.8.51
27,472	S. G. Smout	Wolverhampton Aero Club	20.8.51
27,473	H. R. Bamberg	Luton Flying Club	20.8.51
27,474	K. V. Tipper	Liverpool Flying Club	20.8.51
27,475	B. J. C. Watts	Christchurch Aero Club	20.8.51
27,476	M. E. Southworth	London Aeroplane Club	20.8.51
27,477	W. E. G. Mann	Qualified Service pilot	20.8.51
27,478	R. J. Dolman	Christchurch Aero Club	20.8.51
27,479	D. G. Reed	R.A.F. Ansty	20.8.51
27,480	M. J. A. Hoare	Qualified Service pilot	20.8.51
27,481	J. H. Marvin	R.A.F. Cottesmore	20.8.51
27,482	J. Formby	Qualified Service pilot	20.8.51
27,483	R. K. Moores	Qualified Service pilot	20.8.51
27,484	A. C. G. Binedell	Qualified Service pilot	20.8.51
27,485	R. E. White	Qualified Service pilot	20.8.51
27,486	A. D. Mercer	Qualified Service pilot	20.8.51
27,487	T. D. W. Manley	No. 7 F.T.S.	20.8.51
27,488	A. G. H. Morgan	Cardiff Aero Club	20.8.51
27,489	T. J. Harper	Cardiff Aero Club	23.8.51
27,490	T. W. Griffiths	Redhill Flying Club	23.8.51
27,491	R. K. Cannon	Southend Flying Club	23.8.51
27,492	P. F. de Mulder	No. 9 R.F.S., Doncaster	23.8.51
27,493	J. G. R. Teasdale	Yorkshire Aviation Services Co.	23.8.51
27,494	L. G. Jones	Qualified Service pilot	23.8.51
27,495	J. W. Smith	Qualified Service pilot	23.8.51
27,496	L. W. J. Leask	Qualified Service pilot	23.8.51
27,497	D. E. De Berry	Plymouth and District Aero Club	23.8.51
27,498	K. Johnston	Qualified Service pilot	23.8.51
27,499	M. F. Stephens	Lancashire Aero Club	24.8.51
27,500	G. Moss	Qualified Service pilot	24.8.51
27,501	A. C. Burn	Qualified Service pilot	24.8.51
27,502	J. F. Pattison	Strathtay Aero Club	24.8.51
27,503	J. M. Wiemer	Marshalls Flying School	24.8.51
27,504	D. G. Day	Cambridge Aero Club	24.8.51
27,505	G. A. Corta	Qualified Service pilot	24.8.51
27,506	D. O. Brown	Qualified Service pilot	24.8.51
27,507	D. H. Stonebanks	Denham Flying School	27.8.51
27,508	W. Thomson	Strathtay Aero Club	29.8.51
27,509	H. Nabulsi	Air Service Training, Ltd.	29.8.51
27,510	G. G. Kingsmill	Herts and Essex Aero Club	29.8.51
27,511	J. I. Davey	Southern Aero Club	29.8.51
27,512	W. H. Burnett	Strathtay Aero Club	29.8.51
27,513	D. G. Williams	Cardiff Aeroplane Club	29.8.51
27,514	M. J. Taylor	R.A.F. College, Cranwell	29.8.51
27,515	P. J. Bogue	R.A.F. College, Cranwell	29.8.51
27,516	H. A. Merriman	R.A.F. College, Cranwell	29.8.51
27,517	J. D. B. Christey	R.A.F. College, Cranwell	29.8.51
27,518	J. Cartwright	R.A.F. Little Rissington	29.8.51
		Qualified Service pilot	
27,519	C. F. Rogers	Elstree Flying School	29.8.51
27,520	J. D. Hardcastle	Wiltshire School of Flying	29.8.51
27,521	M. J. Roberts	Herts and Essex Aero Club	29.8.51
27,522	R. C. G. Loakes	Northants Aero Club	29.8.51
27,523	D. H. Smith	Qualified Service pilot	29.8.51
27,524	R. G. M. Dykstra	Strathtay Aero Club	29.8.51
27,525	J. E. W. Keynes	Cowes Aero Club	29.8.51
27,526	C. H. Cole, Jnr.	Qualified Service pilot	29.8.51
27,527	G. P. Gibb	Strathtay Aero Club	3.9.51
27,528	J. A. Golder	Herts and Essex Aero Club	3.9.51
27,529	D. F. Lewis	Wiltshire School of Flying	3.9.51
27,530	J. Wright	Redhill Flying Club	3.9.51
27,531	D. J. Davey	Plymouth Aero Club	3.9.51
27,532	J. Miller	Southern Aero Club	3.9.51
27,533	J. W. E. Trill	Qualified Service pilot	4.9.51
27,534	A. P. Walker	Exeter Aero Club	4.9.51
27,535	R. E. Pride	Qualified Service pilot	4.9.51
27,536	H. H. Fairbairn	Newcastle	4.9.51
27,537	J. Keirl	Qualified Service pilot	4.9.51
27,538	D. Gadd	Qualified Service pilot	4.9.51
27,539	R. E. Harris	Northants Aero Club	4.9.51
27,540	G. A. Lamont	Strathtay Aero Club	6.9.51
27,541	P. T. Crook	Northampton Aero Club	6.9.51
27,542	F. E. C. Underhill	Qualified Service pilot	6.9.51
27,543	W. E. Hassan	Qualified Service pilot	6.9.51
27,544	H. L. Jones	Qualified Service pilot	6.9.51
27,545	W. F. Tilley	Cotswold Aero Club	6.9.51
27,546	L. C. Hawkes	Marshall's Flying School	6.9.51
27,547	R. G. J. Fairrie	R.N. Flying Club	6.9.51
27,548	D. G. Watson	R.A.F. Cottesmore	7.9.51
27,549	H. W. T. Enoch	Qualified Service pilot	7.9.51
27,550	R. F. Wright	Cheltenham Aero Club	7.9.51
27,551	F. H. Benton	Liverpool Flying Club	7.9.51
27,552	P. Murphy	Qualified Service pilot	8.9.51
27,553	J. Wilson	Qualified Service pilot	8.9.51
27,554	F. S. Lau	Denham Flying School	10.9.51
27,555	A. L. Brooks	Qualified Service pilot	10.9.51
27,556	J. L. Fawcett	Yorkshire Aeroplane Club	10.9.51
27,557	R. A. Neaves	Cambridge Aero Club	10.9.51
27,558	P. A. Millard	Christchurch Aero Club	10.9.51
27,559	N. S. Maconochie	Wiltshire School of Flying	10.9.51
27,560	V. J. Burgess	U.L.A.A. Experimental Group	10.9.51
27,561	P. D. Tull	R.A.F. Cottesmore	10.9.51
27,562	F. W. Fielding	Qualified Service pilot	10.9.51
27,563	L. F. Cox	Auster Flying Club	10.9.51
27,564	G. T. Smeaton	Qualified Service pilot	10.9.51
27,565	G. W. H. Byres	Qualified Service pilot	10.9.51
27,566	G. V. Copper	West London Aero Club	10.9.51
27,567	J. L. W. Towler	Qualified Service pilot	10.9.51
27,568	R. F. Oakes	Qualified Service pilot	11.9.51
27,569	K. A. C. Wirdnam	R.A.F. Cranwell	15.9.51

SERVICE AVIATION

Royal Air Force and Naval Aviation News

AIR TROOPING I: The first load of troops of the 19th Infantry Brigade boarding a Transport Command Hastings at Lyneham en route for "somewhere in Lybia."

Army Air-Lift

IN the raw, mist-ridden chill of last Friday morning, at R.A.F. Station, Lyneham, the first batch of troops of the 19th Infantry Brigade mustered for their air-lift out to the Middle East. For Transport Command, it was just another air-bus service, with the difference only that it was bigger than any other one job the Command had tackled by itself since the end of the war. Apart from that, however, it was routine stuff.

The job, in brief, was to transport the troops—about 3,000 of them—out to the present trouble spot in the vicinity of the Suez Canal. For this duty Transport Command used their normal 42-seater Hastings and, on this basis, would need to make 72 trips—a figure which accords with the schedule of 1 take-off every 2 hours, 24 hours a day for 6 days. How many Hastings were being used for the lift, however, no one would say. We counted 19 lined up around the field and parked on the aprons, but this might mean anything or nothing. All that can be said with certainty is that the lift was operated as a shuttle service, for the first Hastings to return from Lybia arrived back at Lyneham, flown by a slip-crew, at 2 a.m. the following day, Saturday.

Certainly, the casual matter-of-factness of Transport Command's handling of the job was impressive. The troops arrived at the station, their luggage was taken and loaded into the aircraft, whilst they themselves were weighed, "manifested" and, of course, refreshed by the inevitable N.A.A.F.I. cup of tea; in the meantime, the aircrew were having their final briefing. The troops were then taken by bus to the aircraft, they climbed aboard, the engines were started, and slowly the Hastings taxied out for engine run-up and take-off.

Each man was allowed an all-up weight maximum of 250 lb, including himself; so far as personal kit was concerned, therefore, the 9-stone man had an edge over his 14-stone comrade; there was, however, little evidence that any man was taking anything more than regulation essentials. At 250 lb per man, the load per aircraft works out at just under 4.7 tons.

The 19th Infantry Brigade is commanded by Brigadier C. G. Lipscombe, D.S.O., and comprises units of the Highland Light Infantry, the East Surreys, and the Devons, plus 77 Company R.A.S.C., the 37th Field Squadron, R.E., the 48th Field Regiment, R.A., and Brigade H.Q.

H.M.S. "Eagle" Handed Over

LAUNCHED by Princess Elizabeth in March, 1946, Britain's largest aircraft carrier, H.M.S. *Eagle*, is now completed and has been provisionally accepted by her commanding officer, Capt. G. Willoughby, R.N., from the builders, Harland and Wolff.

The new ship was due to go to sea from Belfast on October 30th. Today, November 2nd, the Captain and officers are "At Home" to those concerned with her building since 1942, when the keel was laid down. Originally she was named *Audacious*, but in January, 1946, the name was changed to *Eagle*.

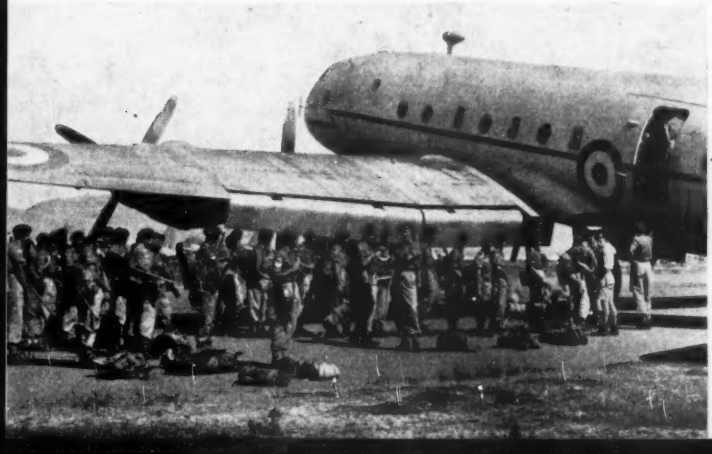
She is due to arrive at her home port, Devonport, on November 5th, when stores, provisions, ammunition and fuel will be embarked before sailing for the Clyde eight days later. The following ten days will be spent at sea, carrying out machinery and manœuvrability trials.

Naval trials will continue throughout the winter, and during the spring *Eagle* will embark her air squadrons, some of which will be flying Attackers. Flying training, gunnery and other working-up practices will follow, and it is expected that the carrier will be in operational service with the Home Fleet in June next.

The present *Eagle* is the 21st ship of the Royal Navy to bear this name and replaces the aircraft carrier of the same name which was sunk in the Mediterranean in 1942.

The ship's motto is *Arduus ad Solem*, and her battle honours go back to the battle of Portland in which Blake administered a beating to van Tromp in 1653.

AIR TROOPING II: Men of the 16th Independent Parachute Brigade waiting at Nicosia, Cyprus, to emplane for the Canal Zone.



Percival Sea Prince T.1

LAST week we illustrated one of the first Percival Sea Prince T.1 "flying classroom" and communications aircraft which are being supplied to the Navy for training of aircrews prior to their joining first-line anti-submarine squadrons.

On this new variant of the Prince, the twin-wheel main undercarriage is of longer stroke than formerly, and the nose of the fuselage has been lengthened to accommodate radar equipment; otherwise the Sea Prince is similar in configuration to the standard civil Prince. As is well known, for an aircraft of its size the Prince fuselage is unusually spacious, and full advantage has been taken of this fact in accommodating many hundreds of pounds of electrical and special equipment while leaving ample room for the trainee crew and instructors

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to move about freely. Included in the equipment is over 860 lb of radio and radar, 720 lb of "electrics" and services, and nearly 200 lb of special navigation devices. Additionally, there is some 700 lb of miscellaneous gear peculiar to the training rôle for which the aircraft is fitted out, leaving an additional disposable load of over 2,420 lb for fuel, crew and stores.

In service with the Royal Navy, the Sea Prince will perform various aircrew training rôles (other than that of "flying class-room"), when alternative equipment is installed on attachments for which provision is made in the basic design.

Award of George Cross

A POSTHUMOUS award of the George Cross has been made to F/L. J. A. Quinton of No. 228 Operational Conversion Unit, for his exceptional bravery in an air collision between a Wellington, in which he was flying as a navigator, and a fighter. He gave the only parachute available to an A.T.C. Cadet, Derek Coates, whose life was saved.

The citation reads: "The force of the impact caused the aircraft to break up, and, as it was plunging to earth out of control, F/L. Quinton picked up the only parachute within reach and clipped it on to the cadet's harness.

"He pointed to the rip-cord and a gaping hole in the aircraft, thereby indicating that the cadet should jump. At that moment a further portion of the aircraft was torn away and the cadet, clutching the rip-cord was flung through the side. He landed safely.

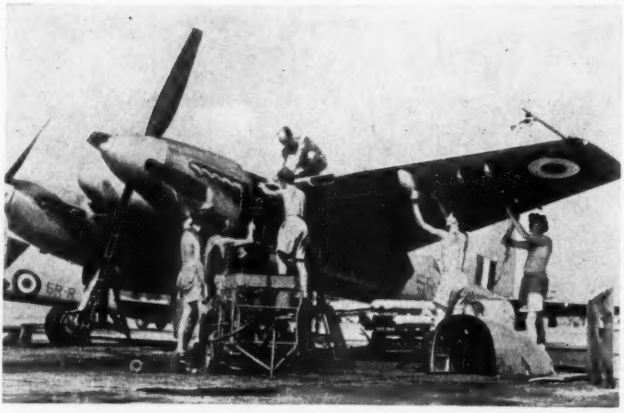
"F/L. Quinton acted with superhuman speed, displaying the most commendable courage and self-sacrifice, as he well knew that in giving up the only parachute within reach he was forfeiting any chance of saving his own life."

Shepherd Memorial Essay

FOR this year's Gordon Shepherd Memorial Prize Essay Competition the problem set was: "The rapidly increasing speeds and ranges of aircraft mean that, in a future war, air forces of two or more nations may have to operate in close co-operation, not only strategically, but tactically, from bases separated possibly by thousands of miles. Command, strategy, tactics, mobility, communications, equipment, training and many other problems are involved. How should an air force be developed and trained to meet these problems successfully?"

The winners were: 1st, F/L. E. A. Knighton; 2nd, S/L. E. Graham; 3rd, F/L. R. Brickwood. A. V-M. D. A. Boyle, A. V-M. Sir Harry Broadhurst and A. V-M. L. F. Pendred were the referees.

PATHFINDER MEMORIAL: At the 7th anniversary party of the Pathfinder Club, held last Monday evening, the president Dr. J. C. MacGown, D.F.C., unveiled a bronze memorial tablet, the inscription on which dedicated the Club to the service of past and present members of the R.A.F., Dominion and Allied air forces.



ETERNAL SUMMER: Aircraftmen servicing a D.H. Hornet in Malaya, where the temperature is rarely known to fall below 86 deg F. For operations against the bandits the Hornet carries 2×1,000 lb bombs, four rockets and four 20 mm cannon.

W.R.A.F. Appointment

THE Air Ministry has announced the appointment of G/O. J. L. A. Conan Doyle, O.B.E., as Deputy Director (Personnel) of the W.R.A.F. The new Deputy Director is the daughter of the late Sir Arthur Conan Doyle and has, since February, 1950, been W.R.A.F. Staff Officer at H.Q. Technical Training Command.

Mountain Rescue Awards

IN recognition of the devotion and courage they displayed as leader and member of a mountain rescue team, F/L. P. Dawes has been awarded the M.B.E. and A/C. M. Brown the B.E.M.

Operating from R.A.F Kinloss, the team to which they belong went to the wreckage of a Lancaster near the summit of a 3,200ft mountain in north-west Scotland. Ten ascents were made when the mountain was covered with 10 to 12ft of snow and in winds which reached 100 m.p.h.

Scone Trophy

GLASGOW University Air Squadron has won the Scone Trophy in competition against the Edinburgh, Aberdeen and St. Andrews squadrons.

The Trophy was given by Airwork Ltd., to Scone airfield for competition between the Scottish University air squadrons. It was accepted earlier this year by A. Cdre. A. R. Wardle, A.O.C. No. 66 Group, who decided that the competition should include pilot-navigation, formation flying and individual aerobatics. Each team consists of three cadets and three instructors.

The Glasgow team comprised F/Cdts. G. S. S. Barr, S. James and G. Moffat and F/Ls. W. A. Gill, J. G. Duncan and R. Kinder. The runners-up were Edinburgh.

MEDME Despatch

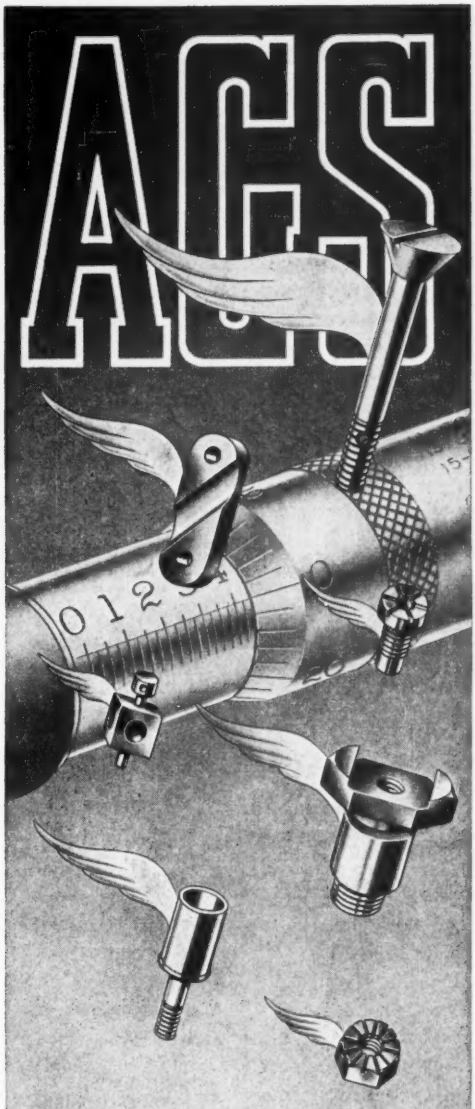
COMPLEMENTARY to Field Marshal Viscount Alexander's despatch dealing with the Italian campaign is another, by Air Chief Marshal Sir Guy Garrod, under the title *The Part Played by the Allied Air Forces in the Final Defeat of the Enemy in the Mediterranean Theatre, March to May*, 1945. It is issued as a supplement to the *London Gazette* for October 29th, 1951. Sir Guy was C-in-C. R.A.F. Mediterranean and Middle East and Deputy Air C-in-C. Mediterranean Allied Air Forces.

This is no story of equally matched forces slogging away at one another, for during the period under review the Allies could put 4,000 aircraft against the enemy's meagre 130. It tells rather of strategic and tactical interdiction, carried out so thoroughly that the enemy could no longer fight where he stood, yet neither could he retreat. It also deals with the air support given to the army during the actual battles and the difficulties of the Balkan Air Force's campaign in Jugoslavia.

Oil production provided most important targets, and by the end of March the enemy's production of liquid fuels and lubricants had been reduced to less than 20 per cent of the April, 1944, level and petrol to about 10 per cent. Oxen had to be used to tow lorries and members of the German 98th Division were offered a reward of a thousand cigarettes if they returned from a patrol with a tin of captured petrol.

In confirmation of the effect of the sustained air attack, Sir Guy quotes two German generals. A statement by General von Senger, commanding the German XIV Panzer Corps, says: "It was the bombing of the river Po crossings that finished us. We could have withdrawn successfully with normal rear-guard action despite the heavy pressure but, due to the destruction of the ferries and river crossings, we lost all our equipment. North of the river we were no longer an army."

General von Vietinghoff, German Supreme Commander, corroborated by stating: "The crossings of the Reno and Po rivers were decisively influenced by the employment of the Allied Air Forces. The smashing of almost all ferries and bridges made an ordered retreat across the Po no longer possible."



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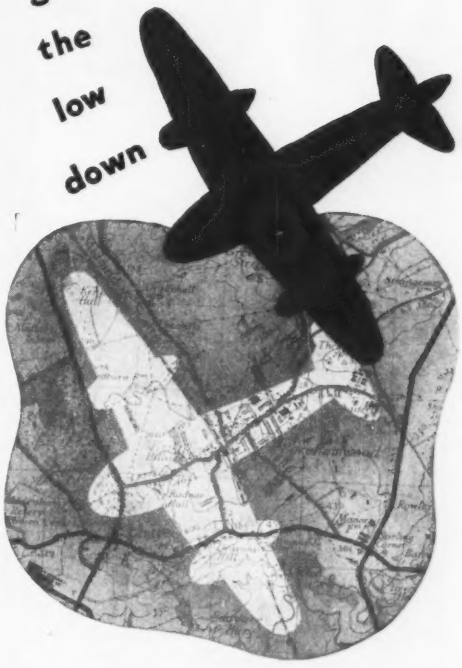

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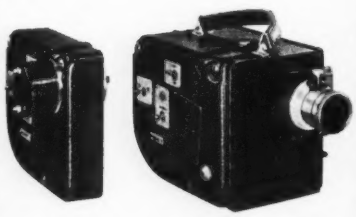

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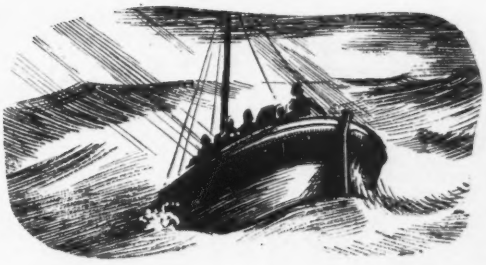

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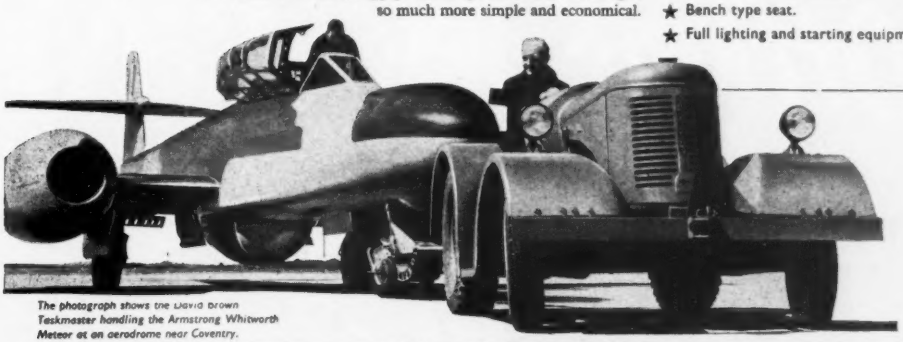

The photograph shows the David Brown Taskmaster handling the Armstrong Whitworth Meteor at an aerodrome near Coventry.

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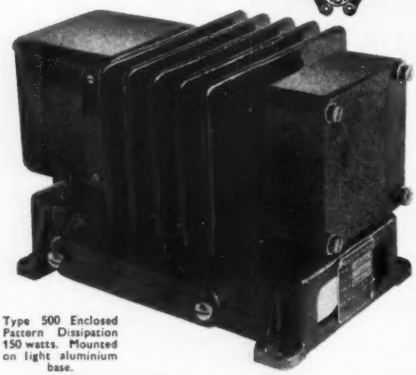

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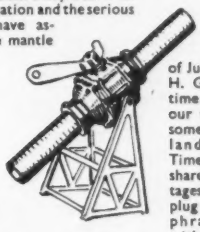

of Jules Verne and H. G. Wells it is time we trained our telescopes on some of the nearer landing strips. Time, too, that we shared the advantages of spherical plug cocks and diaphragm sealing with the Martians or satisfied ourselves that the Saturnalians are not infringing the Saunders trade mark in their sky-sign.

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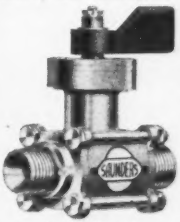

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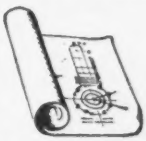

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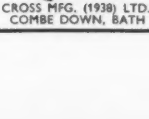

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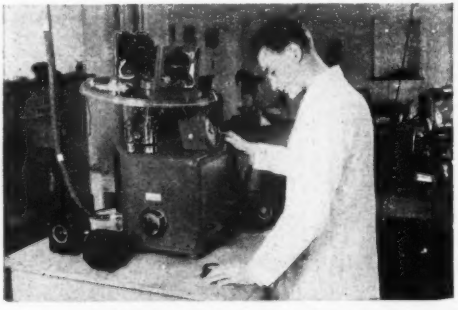
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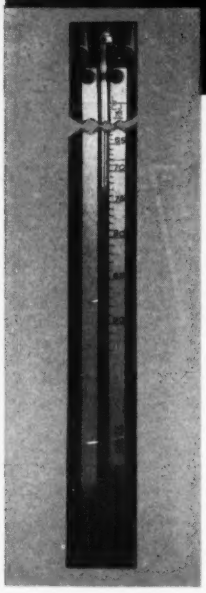

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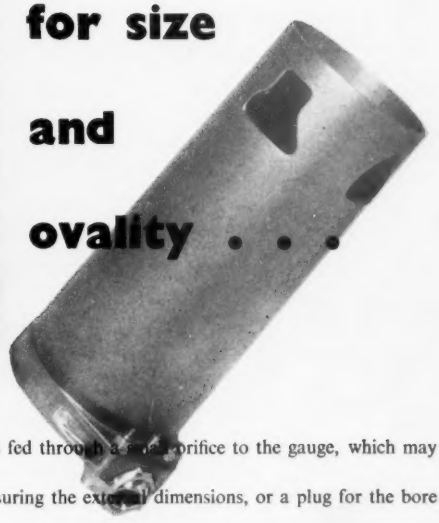

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